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C.G.I.A.

It is part of the educational and industrial system to recognize by various means the successes gained by students as revealed by examination results. Time has conferred on the system its full approbation. Yet up to now, where such diligence has been crowned with success, it is but rare, and then only in outstanding cases, that an educational body recognizes subsequent achievement. Thus we were more than pleased to hear of an award to be made by the City and Guilds of London Institute which is specifically designed to remedy the existing state of affairs. We understand that a scheme is to be launched whereby the thousands of students who have been successful in the various craft examinations will have the opportunity, after an interval of seven years, to prepare a report or a simple sort of thesis on some aspect of their work. If this report is approved, the candidate will then receive the C.G.I.A.—that is, the City and Guilds Insignia Award.

The underlying principle of this award is that, in preparing themselves for attaining the craft certificates, the students acquire an aptitude for study. Its prosecution into subjects germane to their crafts usually results in industrial progress, and it is this type of individual that the City and Guilds of London Institute wish to honour. A period of seven years does provide sufficient time for the neophyte to be transformed into the foreman, under-manager, or even manager.

So far as the foundry industry is concerned, we are personally aware of men who had no opportunity of attending as day students a recognized technical college, let alone a university, but found in the craft courses organized by the City and Guilds a fruitful avenue leading to the attainment of their ambitions. There is a second and equally laudable aspect of the new award and that is the extra incentive given to a youth to continue his studies. We have not seen the official conditions pertaining to the new award, but in the interests of the student, some stress should be laid on acquiring the art of self-expression in writing. So very often in the past we have received requests for guidance from experienced craftsmen as to which correspondence course they should take to add to their knowledge. We have felt like replying, but lacked the courage, that a course covering English and orthography would make a good beginning. However, we hesitate to tender advice to such a distinguished educational authority; on the other hand, however, there is no hesitancy in congratulating the "City and Guilds" on its sensible decision to recognize industrial progress resulting from educational diligence.

E

Steelfounders' Productivity Conference

Attitudes to Productivity

The British Steel Founders' Association has arranged a further conference to discuss progress being made in productivity matters. It is to be held at Ashorne Hill from Thursday evening, November 13, to Saturday lunchtime, November 15. Provisional details of the programme are as follow:—

Thursday, November 13, 8.00 to 8.15 p.m. Opening address by the chairman of the B.S.F.A. (Mr. T. H. Summerson). 8.15 to 9.15 p.m. Report on the recent productivity experiment in France, followed by discussion.

Friday, November 14.

Session No. 1. Professor P. Sargant Florence, of Birmingham University, a well-known authority on industrial incentives, will address the meeting on "Incentives other than Piecework." After the address, the conference will break up into discussion groups, each of which will examine a special aspect of the problem. The discussion groups will later report back and Professor Florence will sum up.

Session No. 2. "New Methods, Plant and Equipment." Talks and films presented by the Research and Development Division of the B.S.F.A. Information recently brought back from the U.S.A., and quite new in this country, will be considered.

Saturday, November 15.

Session No. 3. An examination of the experience of representatives from the various regions, dealing with certain practical problems of productivity. Each region has been asked to deal with one or two selected questions and to appoint a representative to present their views to the conference.

Finally, there will be a general summing-up by Mr. F. A. Martin, chairman of the productivity committee, and a valedictory address by Mr. T. H. Summerson, the chairman.

Further details regarding participation may be obtained from Mr. R. Barber, secretary, B.S.F.A., Broomgrove Lodge, 13, Broomgrove Road, Sheffield, 10.

Authoritative Information on Australian Industry

Readers desiring commercial information about Australian heavy industries, will be interested to learn that the Commonwealth Government of Australia are publishing a reference book called "The Structure and Capacity of Australian Manufacturing Industries." Apart from supplying up-to-date and detailed information of the expansion of Australian basic industries, the book covers the whole range of Australian manufacturing industry, its organization, the inter-relation of enterprises and the adequacy of Australian production to meet present and potential markets. The book should be invaluable also as a reference for those directly interested in secondary industry, either as manufacturers, investors, exporters or importers, particularly to founders envisaging the possibility of extending established, or commencing now, new business or manufactures.

The edition is limited but copies at £3 0s. 0d. each will be available in the United Kingdom and Western Europe in December of this year. Those desiring a copy should register their requirements immediately with the distributors—Angus & Robertson, Limited, 48, Bloomsbury Street, London, W.C.1.

Dinners

JOINT IRON COUNCIL

The culminating feature of the Joint Iron Council's Convention held last Thursday in London was a banquet at the Guildhall, attended by over 600 members and guests. The function was ushered in with the impressive dignity only possible at this historic hall. It was presided over by Mr. F. Scopes, president of the Council, and high-placed guests included the Lord Mayor of London Sir Leslie Boyce, the Rt. Hon. Sir Walter Monckton, Minister of Labour and National Service, Mr. N. P. Newman, vice-president of the Council, Mr. T. A. McKenna, Mr. A. R. W. Low, Sir Percy H. Mills, Mr. S. H. Russell, the Rt. Hon. the Lord Hurcomb, the Rt. Hon. the Viscount Falmouth, Sir Archibald Forbes, Sir John Green, Mr. George Cotton, Mr. G. H. Johnson, Mr. Henry F. H. Jones, Mr. W. J. Drummond, Mr. John Elliot, Mr. Harry Yates, Sir Harold West, Sir Rowland Smith, Mr. Lincoln Evans, Mr. A. G. Stewart, Mr. D. O. Sillars, Mr. F. D. Ley, Maj.-General G. N. Russell, Mr. D. D. Walker.

During the dinner light music was provided by the Royal Artillery Band under their conductor Lieut.-Col. Owen Geary.

INSTITUTE OF VITREOUS ENAMELLERS

The final social function of the annual conference of the Institute of Vitreous Enamellers was a dinner, dance, and cabaret, held in the Holborn Restaurant, London, on Friday last, attended by 240 members, guests and their ladies, and presided over by Dr. Harold Hartley. Following the loyal toast, that of the Institute and the Vitreous-enamelling Industry was proposed by Prof. J. H. Jones, M.A., LL.D., and responded to by Dr. Hartley. Next, the health of the guests was proposed by Mr. S. Hallsworth, chairman of Council, and Dr. C. J. Dadswell, B.Sc., M.I.Mech.E. (president of the Institute of British Foundrymen), replied for the company. The speeches were both witty and commendably short, leaving adequate time for the dancing and entertainment which concluded the evening.

Conference Paper Author

MR. G. SWINYARD, M.Sc., A.I.M., is the Author of the Paper "Grain Refinement of Non-ferrous Castings" presented to the Institute of British Foundrymen's Buxton Conference.* Born in 1923, he served his apprenticeship as a patternmaker with J. Stone & Company, Limited, during which time he gained matriculation to London University. He was attached in 1944 to the foundries technical department of his company; in 1948 he obtained a B.Sc. (London) degree, and three years later an M.Sc. (Eng.) (London) degree, in both cases by means of part-time study courses. He is at present in the metallurgical department of J. Stone & Company (Charlton) Limited. Mr. Swinyard is a member of the Institute of Metals and the Iron and Steel Institute, has served as a Gardom Student on sub-committee T.S.20 of the Institute of British Foundrymen, and in 1949 was elected A.I.M.

* Paper printed in the JOURNAL, June 19; the discussion is printed on page 459 of this issue.

Harper's Five-year Progress

By A. R. Parkes

Perhaps the most interesting and instructive works tour a foundryman can make is to revisit a progressive foundry after an interval of a few years. The writer has just had this experience by re-visiting the foundries of John Harper & Company, Limited, Willenhall, Staffs., which he knew intimately about five years ago. Then, these founders were recovering from the stereotyped output and outlook imposed by war conditions. In contrast, it was a revelation to discover the amount of worthwhile improvement in all sorts of directions—mechanization, control, material utilization, layout, plant efficiency, etc.—which is going forward at the present time, some of which is described in what follows. Such a state of continuous gestation of ideas and projects reveals the need for enlightened guidance on the part of those at the helm, and in this Harper's are singularly well blessed.

Introduction

There must be few who have not heard of the much admired "Harper Skin"—a standard of excellence used to advertise the appearance of castings made by John Harper & Company, Limited—but as readers generally perhaps have but a sketchy idea of the nature of this Midland foundry, a few words by way of introduction may not come amiss, although previous accounts have appeared from time to time in these columns.

John Harper's is mainly a family and very old-established business, having been founded in 1790 by William Harper, the first of five generations of that name in the business. Details of the interesting history since that time are not of present concern,* suffice it to say that the present rate of growth is only a continuation of that obtaining earlier. For instance, in the 1890's there were in all seven foundries and even then the establishment boasted a chemical laboratory. Nowadays, the whole of the manufacturing at Willenhall, which, besides large iron foundries, comprises machine-shops, enamelling, painting, tinning, die-casting, plating and finishing shops, has been concentrated in one works on a site of 21 acres, fronting to Clarke's Lane, and all built since 1926. A total of 1,400 is employed.

Broadly speaking, there are now two main iron foundries manned in aggregate by 670 operatives of whom 280 are moulders. These are interconnected and have one of their longer sides parallel and relatively close to each other. One foundry, that most recently built, is devoted to the production of Meehanite iron castings ranging from 2 or 3 lb.

* For those historically minded, "The Story of the Old Works 1790-1949" by Mr. H. Field, one of the directors of the concern, has recently been published.

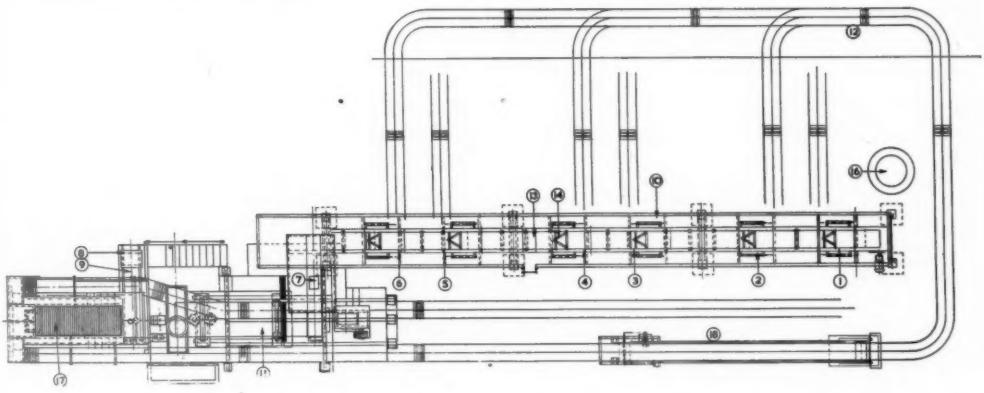


FIG. 1.—*Plan of the No. 1 Mechanized Section at John Harper's Grey-iron Foundry.*

Item No.	Specification.
1	Osborn Rollover moulding machine.
2	" " " "
3	Pneulec Nicholls moulding machine.
4	" " " "
5	Herman Rollover moulding machine.
6	" " " "
7	Elevator.
8	Hopper for magnetic separator tailings.
9	Magnetic separator.
10	Backing-sand hopper.
11	Rotary screen.
12	Pouring station.
13	Overhead distribution belt (backing sand).
14	Plough.
15	Facing-sand hoppers alongside machines (not shown).
16	Sand mill.
17	Knock-out.
18	Hump-r belt elevator for moulds.

FIG. 2.—*Group of Electric-motor Castings at the Knock-out of the No. 1 Plant.*

up to 1 ton in weight at the rate of about 70 to 80 tons a week and has a floor area of 70,000 sq. ft. The other foundry makes about 160 to 170 tons per week of quality grey-iron repetition castings in a range from less than 1 oz. up to about 15 cwt. One significant feature is that output per man/hour has increased by at least 30 per cent. during this period. The shops are lofty, spacious, well laid out, and adequately heated and lighted.

In these foundries, despite the fact that moulding machines of various sorts have long been used as well as mechanized cupola charging, sand-preparation plant and overhead facing-sand distribution, there have until recently been no completely integrated mechanized systems, that is, no casting conveyors and no continuous sand distribution. Now, however, two independent mechanized plants have been installed for specialized classes of work and it is about these that the present account will deal, along with other worthwhile evolutionary changes all in the five-year period just completed. Severally, the new projects are the No. 1 mechanized continuous casting plant begun in 1945; the No. 2 plant which has just come into operation; extensions to the Meehanite foundry stockyard and cupola facilities and, fourthly, the adoption of synthetic resin for core-bonding. The last named has been dealt with in a separate paper.*

NO. 1 MECHANIZED SECTION

The first mechanized section, engineered by Pneulec Limited, came into operation in 1945. It is housed in a side bay of the main grey-iron foundry with a floor area of 6,250 sq. ft., and produces some 20 tons weekly of castings. These mainly comprise stator frames and end-shields for electric motors—a quantity running line with Harper's—the plant being designed round this type of production.

Fig. 1 is a line plan of this section which gives a general idea of the layout. There are six moulding machines working in three teams—two "Herman" 4,000-lb. models, two Nichols machines and two Osborns—box-part sizes varying from 30 by 18 by 6 in. to 22 by 22 by 9 in. The weight range of castings produced is from 12 to 112 lb., metal being taken from the general shop system. As will be clear from the drawing, following upon mould-assembly on short roller tracks leading from the machines, the moulds join a gravity, roller-conveyor loop and soon after are poured from monorail-carried, barrel-type ladles. Passing along the track with manual assistance, as soon as the metal has solidified the moulds are elevated by a power-driven "humper" and thence travel by gravity along a further section of roller-track to the manual knock-out grid. A view at this point is shown in Fig. 2 which also gives an impression of the type of work catered for by the plant. There is a gravity-type roller conveyor for returning box-parts to the moulding stations.

Sand System

The sand plant for this mechanized system was of a revolutionary nature at the time of its installation and, like many pioneer efforts, has not been completely trouble-free in operation, an early disadvantage being the extraction of useful constituents from the sand by the powerful dust-

* "Synthetic Resins in the John Harper Foundry" by J. W. Dews and P. H. Drury, printed in the JOURNAL, May 22, 1952.

exhausting system. At the knock-out, sand falling through the grid first passes a magnetic separator and then enters a rotary sloping barrel the last 12 in. of which is a screen of ½ in. mesh. From this, it enters a vertical bucket-type elevator to join with the main distribution belt which runs the length of the plant above the moulding-machine stations, at which backing-sand hoppers are arranged; these are filled from above by manually-operated ploughs. Sand for replenishment is added at the screen, but has to be separately mixed. Likewise, the preparation of facing-sand—considered an indispensable adjunct to the formation of a superlative casting skin—is carried out in a Pneulec 6 ft. dia. mixer operated independently of the main sand plant and which is situated at the other end of the line from the backing-sand plant. For this facing-sand mixing, a proportion of backing sand from the tail-end of the main distribution belt falls to a platform on the level of the top of the Simpson mill and new red sand and coal-dust are added to the batch mixings, the product being distributed as required (after passing a rotary disintegrator) to smaller shovel-out hoppers close to the machines. This plant has now been running at full production since 1946 and improvements which have become apparent during that time have been incorporated in the plant built more recently.

NO. 2 PLANT

The second mechanized system, known in fact as the No. 2 plant, is also part of the grey-iron foundry and has only come into operation in recent months (see Figs. 3 to 12). In the writer's experience, it is the neatest plant of its type yet inspected and involves several novel features. Among the most striking of these, is the fact that walls of the plant including those partitioning it off from the main foundry bays, are faced with cream-coloured tiles to 10 ft. high from the floor and excellent use of high-gloss cream and aluminium paint is used throughout for the whole of the structures. By comparing the light appearances of Figs. 4 to 12 with the type of illustration more usually shown of foundries—even newly-mechanized foundries—some idea of the æsthetic effect of the enhanced appearance can be conveyed. The staff of the plant, proud of this appearance, are determined to keep it that way if it is humanly possible. Not least in its contribution to neatness is the absence of all but the minimum of structural steelwork for supporting the various items of plant. This is possible because the main sand-distribution system is self supporting from the floor, a structural feature developed by the unusual layout adopted—but more of this later. Incidentally, Fig. 4 well conveys this essential

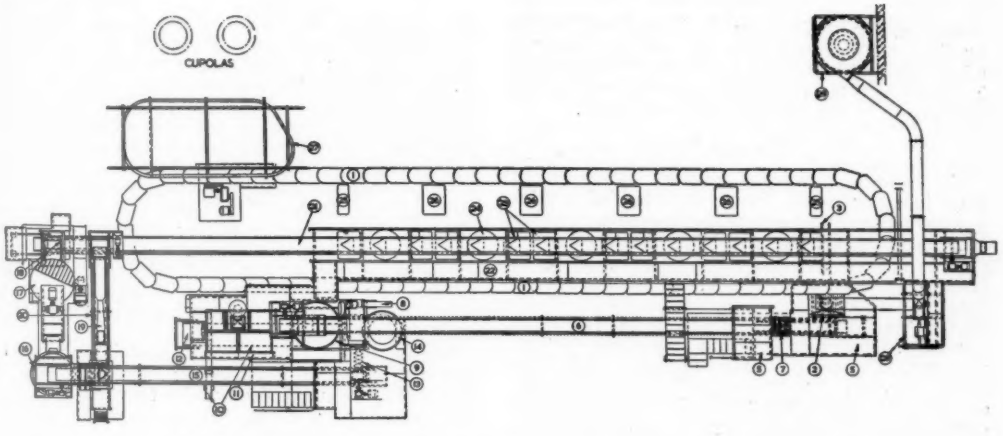


FIG. 3.—*General Arrangement Plan of the New (No. 2) Mechanized Section.*

Item No.	No. off.	Description.
1	1	Mould conveyor—74 plts.—3 ft. crs. by 2 ft. wide.
2	1	4 ft. by 3 ft. vibratory knock-out.
3	1	Pneumatic push-off.
4	1	Knock-out hopper (not shown).
5	1 set	Floorplates and supports.
6	1	20-in. wide knock-out belt.
7	1	New-sand chute with floor grid and cover.
8	1	Magnetic separator.
9	1	10-ton new-sand hopper.
10	1	Rotary screen with dust hood and fan.
11	1	20-ton storage hopper.
12	1	36-in. wide feeder belt.
13	1	22-in. paddle mixer.
14	1	Additions hopper with 5 ft. dia. disc.
15	1	20-in. wide belt conveyor.
16	1	2-ton batch hopper with 5 ft. dia. disc.
17	1	Batch mill.
18	1	Surge hopper.
19	1	Aerator.
20	1	20-in. wide belt-conveyor.
21	1	20-in. wide distributing belt.
22	1	Overhead structure and walkway.
23	10	Machine hoppers.
24	5	Shovel-out hoppers.
25	2	18-in. wide coring and closing tables, 4 ft. long.
26	4	36-in. wide coring and closing tables, 4 ft. long.
27	1	Overhead pouring runway.
28	1 set	Switchgear (not shown).
29	1	Dust-extraction unit.

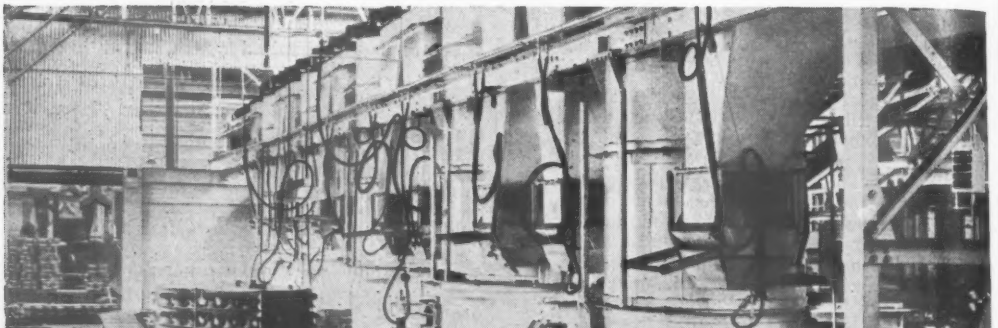


FIG. 4.—*View (along the Conveyor Side nearest the Cupolas) of the No. 2 Plant, showing the particularly Compact Construction.*

simplicity. The whole of the No. 2 plant was installed by Coleman-Wallwork Limited, with the exception of the sand-mill (which is an August's Simpson No. 2 model) and the moulding machines, which were constructed by Harper's to their own design.

Layout

Ten moulding machines are built into this plant; they incorporate no fancy gadgets, being plain power-squeeze and hand-strip types. Six machines take 13 by 18 in. steel boxes and their target is 120 moulds per hour. The four remaining machines take 14 by 12 in. or 17 by 12 in. snap-flasks which are to be superseded by taper slip-flasks of Harper design, the target for the latter being 100 boxes per hour. All machines are fitted with electric vibrators. The general layout of the plant is fairly orthodox (Fig. 3); the moulding machines are arranged in line below the main overhead sand-distribution belt and sand hoppers and are enclosed by a power-driven pallet-type mould conveyor consisting of 74 pallets size 39 by 23 in. Pouring takes place, as soon as the moulds have been closed, with metal from the plant's own cupolas sited immediately adjacent. The head and the further long side (120 ft.) of the conveyor loop circuit is then used for cooling and the knock-out is situated at the end of this long side. The sand-preparation plant is at the opposite end from the knock-out and this itself incorporates a number of interesting features. The plant is designed to produce 25 tons of castings per week of an average of 7 to 8 lb. in each box.

Coring and Other Details

There is a fair amount of cored work included in the production on the No. 2 plant, *e.g.*, domestic food-chopper bodies, and provision for coring up is arranged by a short, powered band-conveyor, 22 ft. long, situated in front of the machines, the speed of which is controlled by the core-layer. Three of the six moulding machines using steel box-parts make bottom-part moulds and these are placed first in the cycle, delivering to the coring conveyor. Here the core-layer selects ready-dressed cores from a special "roundabout" core-rack (see Fig. 5) and, after receiving their cores, the mould halves are transferred to the pallet conveyor. The other three machines of the six are on top-half moulds and deliver their parts directly to close the cored halves already lying on the main conveyor (after the cutting of the runner basins).

Moulds are cast from 85-lb. capacity one-man-operated fixed-level ladles carried on a short mono-rail loop in front of the cupolas (see Fig. 3). To replenish these, a 6-cwt. barrel-type ladle is used in front of the cupola as a holding ladle. Harper's believe a high-class skin finish depends, *inter alia*, on using a carefully controlled pouring rate and this aspect has been particularly studied in the set-up of the new plant.

Manning

The manning list for the No. 2 plant consists of six men on the box-part machines; four on the snap-flask machines; one core-setter; one mould closer; two casters and two knock-out men; one man for weighting (which at present is all manual although a "gadget" is being developed); one man is a sorter on the box-return conveyor; another is a sand-mill operator; a third is a "ploughman," a fourth is engaged on git removal and general

inspection at the knock-out, and finally there is one general labourer more or less in reserve. Only two out of the above (total 22) are really skilled, these being the core-setter, who lays 10 to 14 cores in a 1½-min. cycle, and the mould closer. For manning the self-contained cupola plant, two fully skilled men are employed, one on "early-turn" alternatively, and one labourer.

Sand Circuits

As previously mentioned, the sand systems are arranged in somewhat novel fashion (see Figs. 6 to 9). From the Sterling vibratory knock-out grid, (Fig. 9), the sand passes underground to a rotary-discharge hopper and then on an inclined belt, passing a magnetic "Overband" separator, to a hexagonal rotary screen (½-in. mesh) and thence to a 20-ton storage hopper, where some cooling takes place. From this hopper, sand is withdrawn by under-band conveyor to a paddle-type mixer, where water is added according to "feel." After mixing, it passes *via* an inclined elevating belt, selective plough-off point and squirrel-cage disintegrator on to the main distribution belt above the moulding machines for manual direction into the backing-sand hoppers, the ploughs being operated from the catwalk (Fig. 8).

The integration of facing-sand preparation with the backing-sand plant is one of the noteworthy features of the whole installation. For facing-sand, cylindrical floor-based, shovel-out-type hoppers, one to each pair of machines, are replenished normally twice a day at definite times. New red moulding sand is discharged from incoming lorry through a manhole on to the inclined belt from the knock-out, the normal knock-out sand being interrupted for this period. This new sand is ploughed off at the top of the belt, *i.e.* after passing the magnetic separator, into a 5-ton vertical cylindrical storage hopper. This has a controlled rotary discharge to join the belt bringing knock-out black sand from its 20-ton hopper. Both sands, mixed in controllable proportions from 0 to 50 per cent., then fall into the paddle-type mixer, previously emptied, and coal-dust is incorporated also into this mixer at a controllable rate from an "additions" rotary hopper, the whole being synchronized (see Fig. 7). Utilizing the same belt as normally used by backing sand, the pre-mixed facing sand is then taken to its own 2-ton storage hopper by using an extension of this belt beyond the disintegrator plough. From the facing-sand storage hopper, there is a rotary draw-off for batch milling in an August's No. 2 Simpson mill and milled sand is taken from there to the main distribution belt above the machines, being ploughed off at appropriate points into the cylindrical facing-sand hoppers each of 5 tons capacity (one to each pair of moulding machines). It is these hoppers which support the whole overhead structure of the distribution belt, catwalk and backing-sand hoppers and this means of construction thus offers both economy in steel-work, simplicity, and neatness of appearance.

An interesting detail of mould making is the provision at each machine station of a duplex air/spray gun. A half-trigger operation of these guns delivers compressed air for blowing off the pattern-plate, while full trigger delivers atomized liquid parting medium to the plate before adding facing sand. The parting medium is carried in a 20-gall. tank under the sand-distribution belt and is filled from the catwalk. It is conveyed to the blow-guns by fixed pipelines with flexible delivery pieces, the whole gun and rubber connectors being counter-balanced by sash-weights (see Fig. 10).

The general daylight illumination of the shop is normally adequate, being enhanced by the light colour and high reflectivity of all the plant surfaces. Additionally, there is fluorescent strip lighting at each moulding machine station and tungsten-filament general artificial lighting. Control of the mechanized operations is centralized at one point and allows of individual or synchronized operation of all items. Particular sections are sequence controlled. The mould conveyor has a stop/start control at both the casting point and the knock-out. At the latter, there is foot-operated pneumatic push-off of moulds to the vibrating grid and a top-draught ventilation system. The efficiency of the latter has been increased by the incorporation of a hinged adjustable shutter to take away the heaviest fumes from the rear (see Fig. 9).

Water-cooled Cupolas

The cupola plant serving the No. 2 mechanized section consists of a pair of Roper 24-in. int. dia. more-or-less standard furnaces (Figs. 11 and 12) equipped with Harper water-cooling arrangements. Inside the shell is a lining of 4 in. of ganister reaching 48 in. above the tuyeres. In this are embedded water-cooling segments, 48 in. high, made of cast iron. Above these, the cupolas are normal fire-brick lined to within 24 in. of the charging door, where cast-iron bricks are used. Above the charg-

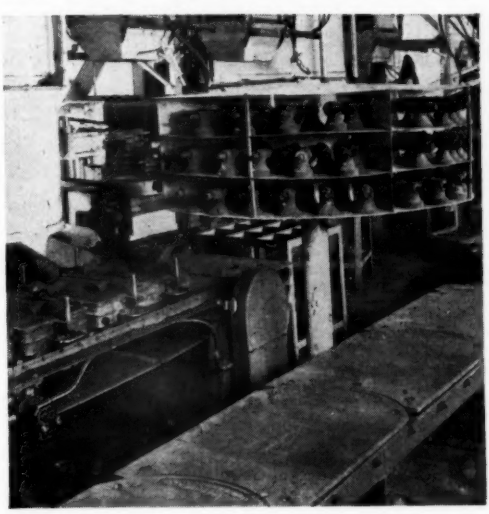


FIG. 5.—*Close-up view of the Core-preparation Turntable and the Coring Conveyor on the No. 2 Plant.*

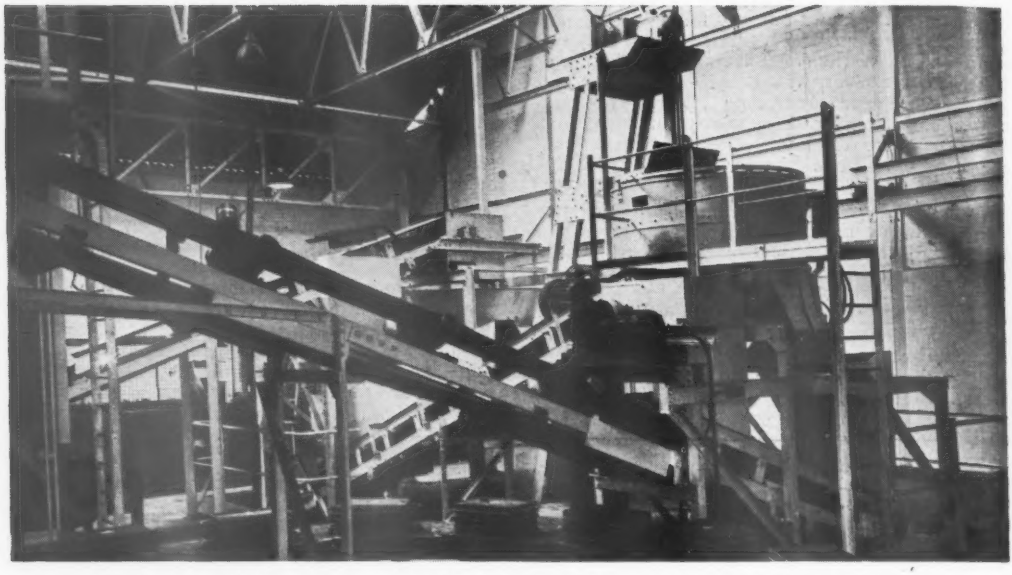


FIG. 6.—*General view at one end of the No. 2 Plant at which the Main Sand Plant is situated.*

ing door a firebrick lining extends to the dust-catchers of the baffle-plate and expansion-chamber type. The furnaces operate on fan-produced blast at 15 in. w.g. pressure and 1,200 cub. ft. per min., a common main being connected to both fans. Water for the coolers is taken optionally from the mains or from a recirculatory system which incorporates a 1,250-gallon storage tank. The coolant is forcibly pumped to the cupola in use at 30 to 40 gall. per min., leading in at the bottom of the segments from a ring main (see Fig. 11). The water leaving from the tops of the coolers runs visually into funnels, one for each segment, and thence by gravity back to the storage tank. This particular system has been in use since December,

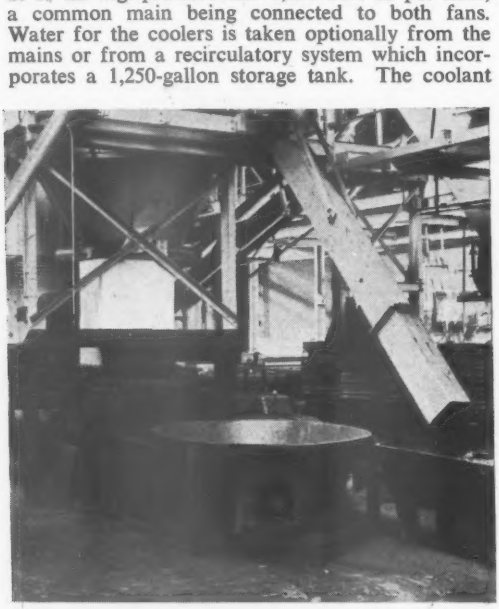


FIG. 7.—*Position in the Sand Plant at which Red Sand, Used Sand, and Coal-dust are mixed in controlled proportions.*

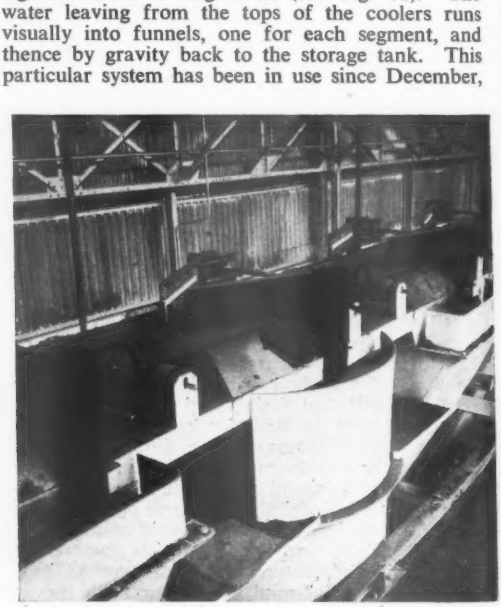


FIG. 8.—*View of the Manually-operated Ploughs on the Sand-distribution Belt above the Hoppers: Circular Hoppers are used for Facing and Rectangular Hoppers for Backing Sand.*

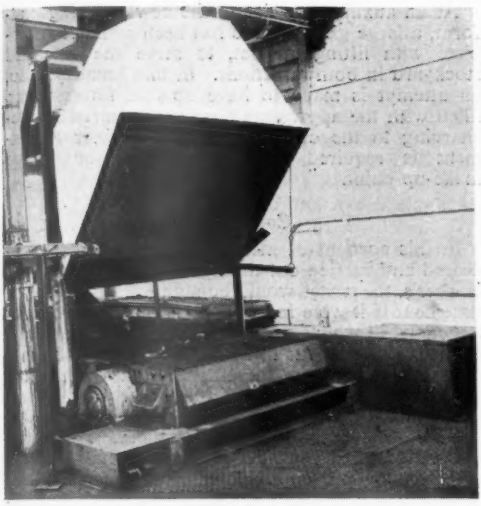


FIG. 9.—*Vibratory Knock-out Grid, showing the Variable Baffle-plate fitted to the Overhead Exhaust Canopy.*

1951, but a similar water-cooling arrangement has been in operation with outstanding success for the last eighteen months on the 38-in. dia. cupola at the firm's Meehanite foundry. Important features are the possibility of always being able to direct cold mains water direct to the cooling segments and being able always to inspect the rate of flow from each segment.

An external view of the pair of cupolas serving the No. 2 plants is shown in Fig 12, although arrangements for charge preparation and raw-material

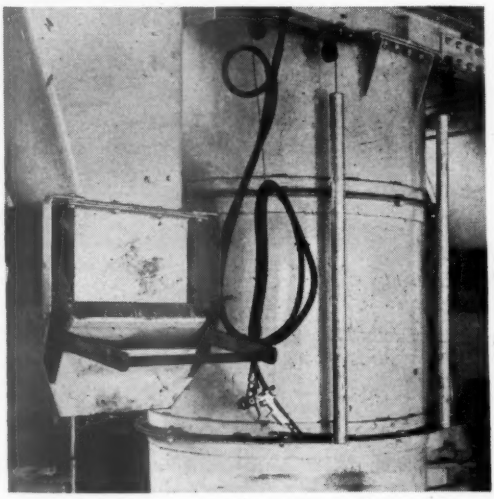


FIG. 10.—*Close-up Arrangement of the Dual-purpose Blow-guns and method of Suspension.*

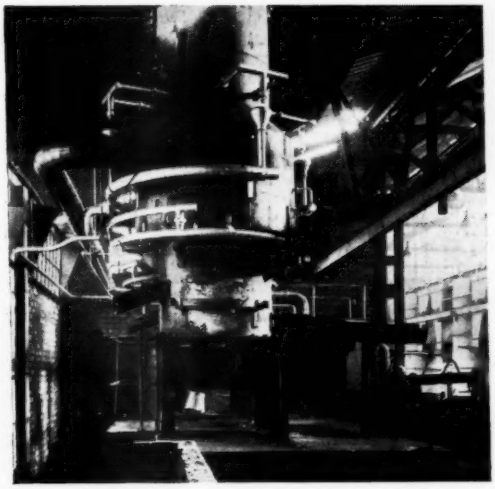


FIG. 11.—*Base of the Cupolas during erection, showing the provision for Water-cooling.*

storage are not yet completed. The furnaces are charged mechanically by Roper inclined hoist, the charge being distributed to the furnace in use along one leg of a bifurcated chute. The 450-lb. charges are made up at ground level in a skip carried on a monorail and suspended from a dial-type weigher. A feature aimed at is the return of scrap from the

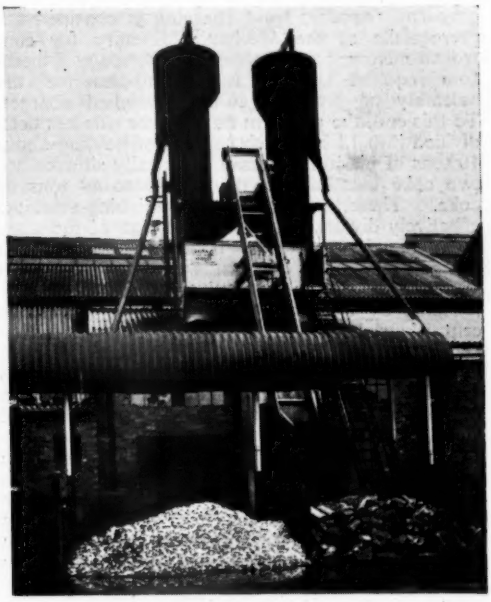


FIG. 12.—*External view of the Roper Cupolas and Charging Arrangements.*

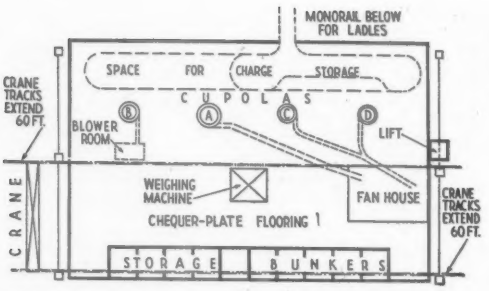


FIG. 13.—*Line Plan of the Rebuilt Meehanite Cupola Stage, illustrating the Segregation of Materials from the Weighed Charges.*

foundry to the melting plant in containers carrying approximately the weight required in the cupola charge make-up, thus avoiding much double handling.

MEEHANITE CHARGING PLATFORM

An additional feature at the Harper Meehanite foundry provided during the last five years is an enlarged cupola stage, material storage and charging arrangement, as well as the incorporation of two smaller cupolas (C and D of 32 in. int. dia.). The original layout served two cupolas, A of 38-in. dia. and B of 48-in. dia. which were built into the new scheme, as shown in Fig. 13. A view of the platform is shown in Fig. 14. Distinct from the highly-mechanized skip-charging in the firm's grey-iron foundry, hand charging is considered a prerequisite at the Meehanite foundry for controlled melting conditions and much space is therefore required adjacent to the cupolas for the assembly of pre-arranged and weighed charges. To this end, the platform on its outer side has been divided into 12 bins each capable of holding about 10 tons of pig-iron or scrap. Centrally situated are two coke bins each containing 30 to 40 tons of coke. These, except for the weighing-machine, effectively divide off the outer portion of the stage from the inner, which, being adjacent to the charge holes of the cupolas, is used for storing the prepared charges. Thus all transport of charges (effected by electric truck) has to be across the central weighbridge, which is of both indicating and recording type so that double check is made of material consumption. At the cupola spout, the ladle monorail also incorporates a weigher, and a third check is thus imposed on the amount of metal melted.

The Meehanite foundry stockyard has also been newly laid out, with the effect of segregating each 10-ton load of metal for individual analysis at the laboratory, so that its incorporation in the charge make-up at its *actual* composition values can be computed. This has proved of inestimable value nowadays, when from pig to pig in a consignment there is often quite significant variation. Furthermore, a valuable check can be kept on stocks and consumption figures.

As an auxiliary service to the new charging platform, a large gantry crane has been installed, complete with lifting magnet, to serve the extended stockyard in both directions. In this foundry, also, an attempt is made to have bins of return scrap filled with the approximate weight required for recharging to the cupolas, thus only minor adjustment is required to the weight at the charge make-up point.

Conclusion

In this account of methods improvements, engineered and carried out during the last five years at Harper's, the writer would be guilty of gross understatement if it were inferred that these are the only directions in which advancement has been effected. Actually, innovations in both major and minor key, both complementary to and separate from those described are continually going forward in an evolutionary manner and their fruition will doubtless form the basis of future comment. Amenities are well catered for; indeed, the original shower-baths having proved so popular, extensions are in hand which will give three times the present capacity in addition to provision for women core-makers. There is a separate apprentice bay, supervised by a highly-qualified full-time instructor. Also, as recently reported, the Company have acquired the St. James Works Foundry at Poole, Dorset. Not least, there is that attitude of mind among the executives and directorate of the firm which acts as a spur to enterprise and initiative in many directions.

In concluding, to his many friends at John Harper & Company, Limited, the writer makes grateful acknowledgment for courtesies shown and assistance rendered.

FIG. 14.—*Spacious Platform at Charging-door Level; Charges are transported on the Platform by Electric Truck.*

Cost Clinic*

"Cost to make" estimates were requested as competition entries for a casting to a given drawing. The entrant, who remained anonymous until the close of the proceedings, was asked to submit a detailed routing sheet and a cost sheet, the former indicating method, operations and times, and the latter how the price of the materials to be used was built up and as fully as possible the manufacturing charges. Below, the adjudicator's remarks on the entries are given, details of the winning entries are listed, and included is a report of the discussion which followed.

The drawing supplied to entrants in the Brassfoundry "Cost Clinic" competition is reproduced in Fig. 1, while Figs. 2 to 4 show three stages in the production of a sand casting produced by the Phosphor Bronze Company, Limited, subsequent to the competition to the drawing given. Sand-casting foundry competitors were asked to base their estimates on the imaginary enquiry for 500 castings in brass to specification B.S. 1400—H.T.B.I.-C. (high-tensile brass), while die-casters were to base theirs on 5,000 castings in B.S. 1400—A.B.I.-C. (aluminium-bronze).

Six entries were submitted to the Conference for adjudication and discussion, each under a nom-de-plume, and were examined in detail by an adjudicating committee which discussed relative merits and arrived at a decision as to the winners. Then, at the meeting proper, the reasons for arriving at this decision were first explained in the following manner, which is a report of a discussion between the chairman and two adjudicators, Mr. C. D. Hunter (management cost consultant) and Mr. A. N. Wormleighton (Phosphor Bronze Company, Limited).

REVIEW OF ENTRIES

General Survey

THE CHAIRMAN, Mr. W. H. Davies, explained that he and his fellow adjudicators had the competition entries in front of them and had already decided the result, and they had now to tell the Cost Clinic not only what they considered the result to be, but also how they had arrived at that result. The intention was to limit the survey to a few main headings, but to re-conduct it along the lines of the survey they had already carried out. They would endeavour to describe the salient points for which they were looking in the six entries, and what they found there, pretending that they had not seen the entries before.

The first objective was a sound technical approach to the job and whether or not there had been a technical survey. Then the treatment of weight, melting loss, and patterns or dies was assessed. They had rather strong ideas about the allocation of overheads, and did not themselves like the practice of throwing all the overheads into a pool and distributing them merely on the basis of the productive labour content of the job.

Next, they had been concerned to see that each one of the entrants had indeed done in sum total what had been asked for, and in order to ensure that, they had re-read the pre-Conference competition rules. The position envisaged was that the drawing had been received by a firm and the managing director asked "What will it cost to make?" One of the entrants possibly ought to have been disqualified at the outset because he did not say what the cost to make was, although he did give a selling price.

THE CHAIRMAN, introducing a detailed examination, said it was clear that some of the entries had not been put on forms because they had the name of the company on them, and in order to suppress the authorship, competitors had not used their companies' forms, and therefore he did not think marks could be given for printed forms as against plain paper.

MR. HUNTER agreed. He set great store by the technical survey and asked himself, "Had the person presenting the example really assimilated all the facts and conditions which he had to meet?"

Technical Survey

MR. HUNTER said that Entry No. 1, in common with all others, tackled the technical survey very well. It had been generally appreciated that this must be set down clearly at the enquiry stage.

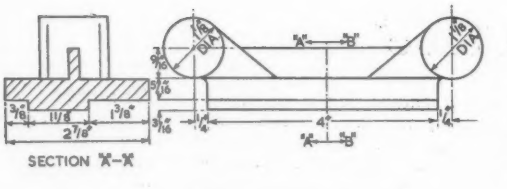
THE CHAIRMAN said they were a little troubled by an entry which did not actually carry any description of the technical survey, however, common sense told them that the competitor could not have achieved the result he did unless there had been a sound technical survey, and then it was found he had put in a standard job-card on which all the processes by which the work was going to be done had been adequately written down—operation number, section of the works, the machine or group number, actual operation, labour grade and the hours per hundred even down to and including inspection and testing.

MR. HUNTER added that behind these particular cards there was what he would call a "product cost-sheet," which not only carried the determination of the operations, but also the times which had been envisaged or allocated to each operation, perhaps through synthetic data or some other process.

THE CHAIRMAN thought as far as the technical survey was concerned, they were satisfied that it had been carried out, and in allocating marks, each entry should have the same number for the technical survey.

MR. HUNTER said there was a technical point

* Report of an enquiry into costing methods in sand and die-casting non-ferrous foundries, organized in the form of a competition for discussion at the Harrogate Brassfoundry Productivity Conference, under the chairmanship of Mr. W. H. Davies, B.Com.



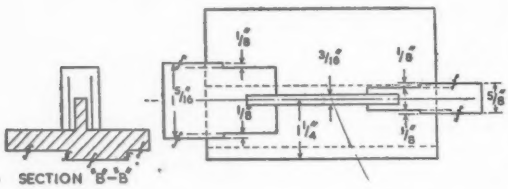


FIG. 1.—*Drawing which accompanied the Simulated Request for a Quotation for 500 Castings in High-tensile Brass Alloy (or 5,000 Castings in Aluminium-bronze Alloy as Die-castings) in the "Cost Clinic" Competition.*

which might be brought out here. That was that the casting could be made much better than under the conditions obtaining. One was justified in asking for a concession. It was not unnatural for concessions to be asked for in the foundry industry and, from personal knowledge of die-casting in particular, that very often happened. In the particular case, for instance, it might have been much better if a concession had been granted to taper the boss into the base-plate, as shown in Fig. 4, but only one competitor put this point forward.

Weight Calculation

MR. HUNTER said it was rather amazing that there was such a wide discrepancy in the estimated net weight of the casting. One expected to find, because of the difference in the techniques employed, quite a lot of difference in the gross weight, on account of the runners and risers and so forth being totally different, but the net weight should surely be more precise.

THE CHAIRMAN said the fifth paper arrived at a net weight of 2.86 lb. each; then there were 2¼ lb., 2.7 lb., and about 4.3 lb. for others. The last one he understood to be a gravity die-casting, and perhaps machining allowances which were included were somewhat less because of that application.

MR. WORMLEIGHTON interjected that the actual weight of the casting was 2 lb. 4 oz.

THE CHAIRMAN felt that one entry which otherwise was particularly good was substantially wrong in the weight, at 4.3 lb., which, of course, meant that the weight of the metal going in was 4.8 lb.; that could not be overlooked.

MR. HUNTER added that in competitive practice, that particular company was not very likely to win the contract.

THE CHAIRMAN said there was yet another entry for which the weight was 1 lb. each, unfettled. This was an otherwise good estimate, but the weight error was very dangerous. It was to be hoped it came from an exceedingly well-established foundry with customers who would not accept such a silly quotation, but would say, "There is something wrong with your calculations, you must have underestimated the weight." This emphasized how very important was the finished weight, because with all the other calculations and all the other estimations, however carefully done, in the end there was a lump sum of money to be divided by a weight. The calculation was so much per lb. and the competitor wanted to quote so much each. Furthermore, in this case the cost actually was not declared, only the selling price, and that was less than half any of the other cost prices, merely because of weight miscalculation, despite a very full technical survey before the competitor began.

MR. HUNTER said the one being considered was for a sand casting, 500 off, but if it was for a gravity-die-casting in aluminium bronze and the quantities were 5,000 off, a similar mistake would be multiplied five thousand times instead of five hundred times. On this sand-casting entry, weight had been arrived at in a gross, overall manner, without evidence of arriving at the weight per casting. It was a result from a series of calculations, possibly, but there was the bald statement that the contract would require 13 cwt. 1 q. 18 lb.

Melting Loss

THE CHAIRMAN said it looked as if the weight of the castings had been ascertained and then just five per cent. added for melting loss; yield did not seem to have been taken into consideration at all. (A rough calculation working back, gave a weight per casting of about 3 lb.) Thus no evidence was presented that there had been really careful consideration of the weight.

MR. HUNTER said he thought there was a weight given at 2.86 lb.; whether it was a net weight or not was not stated.

FIG. 2.—*Bottom-half of Sand Mould showing One Method for producing the Casting Required.*

THE CHAIRMAN said he had not personally overlooked that weight of 2.86 lb., because in the body of the estimate the competitor said that was the weight of the casting, plus 5 per cent. melting loss, but there was no reference to the quantity of metal that had to be melted. That was surely quite a serious omission, and one which had affected the final results of the estimate.

The next point looked at was melting loss, and although in some cases it was a little difficult to interpret, in all except one entry the melting loss had been declared as either five or six per cent.

THE CHAIRMAN said in the particular case lately considered, they could not find any reference or calculation which took into consideration melting loss, so they had marked up the fact that one of the entries appeared to have omitted allowance for melting loss.

Runners and Risers

Next, the adjudicators were anxious to see that the credit for runners and risers was allowed. In a particular entry they were critical and rather surprised because, starting from the top and going down, everything seemed in order and then suddenly it was found "Credit runner and risers, 4.8 lb. less 5 per cent. melting loss, that being 4.56 lb. at 2s. 6d. per lb.

MR. HUNTER said the point there was that that was the complete cost of metal in a ferrous foundry, where it was called the "cost of the metal at the spout;" in a non-ferrous foundry perhaps it might be called the "pouring cost," but that was the cost of putting the metal into the mould. This was one of the points which might be discussed with great advantage amongst members. Was it really correct to return the runners and risers back into the pot at the cost of metal at the spout? There was embodied not only the cost of the metal used, (*i.e.*, the metallic content of the melt) but also a certain amount of labour in getting the material into the pot, and quite a lot of money in melting it. Was it sound that one should credit back into the pot the whole of that expenditure? Would it be a better concept if it was agreed to charge back runners and risers at the metallic content?

FIG. 3.—*Castings, with Runners and Risers attached, after Stripping from the Sand Mould.*

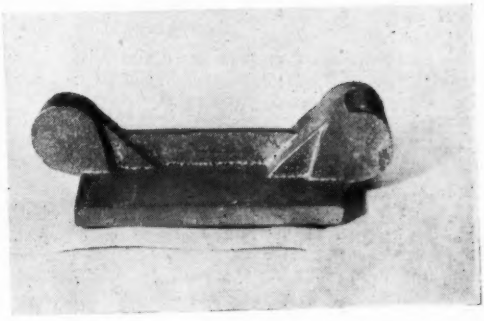


FIG. 4.—*Aluminium-bronze Casting produced by Sand Casting to the Design Specified.*

MR. WORMLEIGHTON said there must be some allowance because the runners and risers going back into the stores carried oxide and dirt which was not metallic.

THE CHAIRMAN added that there was the case mentioned earlier in which, because the gross melt was not mentioned, the competitor had no need to consider credit for risers, and it was felt the whole approach to the weight problem was not sound. In yet another case there was complete omission of reference to credit for runners and risers. Really, therefore, of all the entries only two were the judges prepared to accept: there were two they did not like, and there was one where they were critical, not of the method, but of the value which was put on to runners and risers as they went back into the metal stores.

Interim Summing-up

Summarizing the position up to this stage, it was found on the technical survey all the papers were satisfactory; on the concession, which it is felt should have been requested, all were unsatisfactory; on the weight calculation, there were three with which they were satisfied, one was too heavy and one too light, and there was another where they thought the calculation was missing. Melting loss was specified except in one case, and on the credit for runners and risers the judges were most at variance with competitors because there were only two with which they agreed fully.

Patterns

MR. HUNTER said that on pattern consideration, entries seemed to lack detail, although there might be much detail work behind a particular one.

THE CHAIRMAN said another entry merely stated: "patterns estimated at £2 10s. 0d., tools and jigs estimated at £3. This cost would be charged as an extra if for one single order, repeat orders at actual cost of the job only."

MR. HUNTER thought that was chancey. Here

Cost Clinic

was someone bold enough to make an estimate, or a guess, of the price to be charged for a pattern from some outside supplier, yet one would like to see some sort of reference to a price for a similar pattern or else some evidence that an estimate had been obtained.

THE CHAIRMAN said another gave a detailed estimate for making a pattern—"estimated actual time required, 9 hrs. 51 min." A pattern which it was known was going to take 10 hrs. to make would not be available outside at £2 10s. 0d.

Routing

THE CHAIRMAN, on the question of routing, said it was either carefully described or had been left out altogether. In one particular case where it had been left out, 82½ per cent. of the space was taken up in arriving at the point where the cost of the metal for casting had been ascertained and there was just a bald statement at the end. Obviously there was information not declared and it made that particular entry a bad one. Another entry went into routing in great detail and gave a complete description of everything which was going to be done at every phase. Indeed it was agreed that on all entries except one full marks should be given for routing. On another one was an operation entitled "cast," perhaps that was a local term which did in fact include melting.

Overheads

THE CHAIRMAN continuing said that, based on routing, was the allocation of overheads, and the judges had found themselves in complete agreement that the right way to allocate foundry overheads was to departmentalize them and not to apply an overall rate. In the case where there was a bare labour cost at a shilling there was also "general foundry overheads, including sand, say so much per lb." and the allocation of departmentalized overheads was indeed made. This was also the case in another estimate, where there was what might be called a "cost centre rate," where the allocation of the overheads to the cost centre had been scientifically ascertained. Nevertheless, it was found that in four cases the departmental overheads were not allocated, and the judges particularly surprised to find they were not allocated in the gravity die-cast case, because that estimate went into the greatest detail on every point.

MR. HUNTER confirmed that that example was very well constituted and yet it took 125 per cent. and spread it all over the whole. Why was so much detail introduced only to take all the direct expenses and even the company expenses and spread the whole at a fixed ratio? That did not seem the right attitude of mind.

THE CHAIRMAN agreed that the steps in that particular die-casting estimate conformed to almost technical perfection and then disappointingly there was the overall lumping of 125 per cent.

Cost of Making

Finally, said the Chairman, the judges were anxious to see that all added up to the "cost of making." One or two of the entrants stopped at that, yet others went on and gave the selling charges, missing the point that because this particular job stopped there, meant that there was a danger that lumping the overall overheads as a percentage of the labour gave the "cost of selling" included in the "cost of making." Selling overheads should not go into the cost of making.

One entry nowhere declared the cost of making, and overheads were dismissed with "add 200 per cent." The percentage was not criticized, but adding it all on to the productive labour was not right. Then, profit was added, and this was the case where there was a declaration of a selling price of 4s. 6½d. each. Other costs of making came out at 9s. 0½d., 11s. 2½d., 11s. 0d. and 10s. 5½d., and much of the variation was due to the allocation of overheads. Die-castings for 5,000 off came out at 6s. 7d. each.

Result

The judges narrowed down their award of the prize between entries under the pseudonyms "Jock's Job" and "Windrush," one being on the die-casting process where it was, of course, impossible to get a point by point comparison all the way through. In their summing-up, there was a serious departure from recommended practice in this particular case of die-casting, namely that overheads were not departmentalized, and so the judges reduced the value of that entry by one very large mark. With the other estimate, there was not so glaring an example of faulty practice but it was thought to be a little shaky on patternwork and the adjudicators were not very happy about the weight calculation. The difficulty had been overcome by an agreement to share the first prize.

It was found subsequently that the entry under the pseudonym of "Jock's Job" (as a die casting) had been submitted by Mr. E. J. Brooke of the Aluminium Bronze Company, Limited, and that "Windrush" (as a sand casting) was the pseudonym of Mr. L. Buckley of Newman, Hender & Company, Limited, and the prize of £10 was divided between these gentlemen.

ACTUAL ENTRIES

Sand Casting

This entry embodied no technical survey as such, but included was a series of five printed job-cards, pink in colour, which contained information proving that a technical survey had in fact been carried out. Severally, these cards listed the principal operations, *viz.*, operation number, department, machine or group, labour grade, time allowed, as well as identifying data for the main operations of (*a*) *moulding*—three in a box at 7.73 hrs. per 100; (*b*) *cast*, 3.25 hrs. per 100; (*c*) *knock-out and service*, 5.15 hrs. per 100; *fettle*, 5.00 hrs. per 100, and *inspection and test* 0.70 hrs. per 100 (this last being duplicated on a separate stores delivery card bearing also the quantity (500), the material release (530) and the drawing number (040452).

TABLE I.—*Product Cost Sheet Submitted with Sand Casting Winning Entry (the reverse side provided for a continuation of the bottom portion and right-hand data)*

	Customer				Date issued	Date due			Date						
									Gross mat'l	@ 181/- per 100 lb.		s/- per 100 1,556.6			
Component	Matl. release 530		Dwg. No. 040452		Part		Size & Fig. No.		Metal credit	@ 177/- per cwt.		679.5			
	Pattern cost £20 per 500								Net mat'l			877.1			
	Matl. spec.	Rgh. wt.	Fin. wt.	Fdry.	Part		Size & Fig. No.		Labour and M.E.			142.2			
	Brass B.S. 1400 HTBI	860	430	6 All.%	Enquiry AB 93				Works cost			1.019.3	1,099.3		
									Patterns per 100			80.0			
	Opn. No.	Dept.	M/c or Group	Operation	Labour grade	Time allowed Set-up hours	Time allowed Hours per 100	@					= 11/- ea.		
	F1	BF	12"	Mould 3 in a box	FM5		7.73	7.370				56.9			
	F2	BF	—	Cast	FM9		3.25	7.213				23.4			
	F3	BF		Knock-out and service	FM3		5.15	7.050				36.3			
	F4	F		Fettle	FM4		5.00	4.023				20.1			
	F5			Inspection and test	FM4		0.70	5.933				4.1			
						Sub-total						140.8			
				Allow for trials and running system			1%					1.4			
												142.2			
				Works cost is 11/- each											

As the major control feature, there was submitted with this entry a "product cost sheet," Table I, in the form of a card some 12 in. wide by 10 in. deep printed on both sides. This carried not only duplication of the information contained on the job cards as to the five principal operations, but also such details as gross material cost and credits, pattern costs, metal specification, inquiry data, allowance for trials and running system (computed at 1 per cent.), etc. Against each entry suitable figures were inserted in the appropriate spaces, leading to a summation for the works cost of 11s. each.

The final item completing this entry was a "route sheet." This listed the sequence through which the inquiry passes on receipt at the foundry and included, after entry and numbering:—(1) Pass to control, *via* drawing office where calculated weight is added; (2) foundry control, then issue cost sheet complete with all relevant information (see Table I); and (3) patternshop—500 off, three mahogany split patterns, and one 12 in. square moulding plate—total cost £20 (including 75 per cent. overheads). Finally, was recorded the information "ready for trials four weeks from receipt of order."

Die-casting

The routine to be followed on receipt at the competitor's works of the inquiry for 5,000 die-castings of the part shown in the drawing (Fig. 1) was given as follows:—First, the inquiry is entered in the inquiry register and an estimating "set"* is raised. This consists of:—(1) An inquiry analysis card (punched-card system); (2) technical report form; (3) tool-department estimate; (4) sub-contract buying department inquiry sheet; (5) die-casting department inquiry sheet; (6) sales inquiry sheet (estimating copy); and (7) sales inquiry sheet (sales copy).

With each item of the "set" was included detailed explanatory notes as to the purpose and routing. For instance, the sales side of technical report* should be filled in by sales department in the light of their knowledge of customers' requirements, and the estimating set and customer's drawing or sample is submitted to works (*i.e.*, estimating department).

* Owing to pressure of space, it has been found impossible to reproduce all the charts and forms submitted as part of the original entries. It is hoped to elaborate these when the final Conference Proceedings are published.

Cost Clinic

Die-sinking

As a further example, the tool department estimate contains detailed and precise information as to designs, alloy specifications, etc., of tools to be used in making the die, which is itself fully described as to runner design, front and back sides, inserts, cores, and the like required. Next it contains general data, the entry for which reads for the part being considered: "Gravity die; 1 off; 1 impression; max. weekly production, 1,000; sample, 8/12 weeks; estimated life, 10,000; general limits, plus or minus, 0.010 in.; machining allowance, $\frac{1}{32}$ in.; and max. draft angle, 2 deg. Finally, there are listed detailed costs for the die-making, incorporating departmental overheads and totalling some £85. The note is added that a slight casting draft of 1 deg. would be allowed on the outer form of the casting.

This tool-department estimate is raised on receipt of every new inquiry by the sales department and is passed to the estimating department. The estimating department passes the form to the drawing office together with any drawings or sketches. Next, the drawing office, in consultation with the works management and tool-room foreman will:—(*a*) Consider die design; (*b*) estimate die-manufacturing operational times; (*c*) estimate die material requirements and (*d*) die delivery date; and (*e*) will pass the form to the production-control department. This department, after studying the form in conjunction with the die-casting department inquiry, will return it to the estimating department, who will evaluate the form and, after completion of the sales inquiry form, will file the tool-department estimate. Finally, the form is retained by the estimating department.

Routing

The inquiry or inquiries are considered by a daily meeting of a technical committee consisting of works management, designer and estimator who, after consideration as to the suitability of the application, decide on method of production, etc.

The "set" then goes to each department concerned, *i.e.*, to the drawing office for design details; the drawing office and tool-room foreman for tool cost; the production control department for production times; and the buying department for bought-out and sub-contract items. Subsequently the "set" goes to the estimating department for extension and evaluating of works cost and is then submitted to the works management for perusal and signature and, after submission to the accounts department for credit rating, is returned to sales manager. The selling price is then determined and the quotation raised.

DISCUSSION

THE CHAIRMAN announced that the prices for the casting shown in Figs. 1 to 4 were 6s. 7d. each for the die-cast items and 11s. for the sand-cast job.

MR. L. BUCKLEY (joint winner) said that in reading the questionnaire, competitors had found some difficulty in that it stated "standard costs," and they had rather concentrated on the method of the layout of the standard cost and had not worried unduly about the finished price.

THE CHAIRMAN said he was the only one of the judges who had experienced disappointment that the results were not closer. He quite agreed with his colleagues that it did not matter, because it was the method with which they were most concerned. Nevertheless, it did not seem to him that the method could be truly applied without bringing out the same results.

MR. WORMLEIGHTON pointed out that the net material content of the job had varied from as low as 2s. 2d. to as high as 10s. 3d., excluding the pattern material.

MR. COLLINS, referring to the fact that the final prices were not comparable, suggested it was quite possible that the founders who had submitted the entries would not have had access to correct overheads, but would have had to assess them. As they did not all come from the same firm they would not all be accurate. Possibly the foundrymen who had submitted entries were not estimators, and it was a job which really needed the collaboration of a foundryman on the moulding technique, together with an estimator on development of the cost. Again, with regard to the weight of a casting, that would vary a great deal, sometimes dependent on the moulder who had made it and whether he rapped it a lot or not. In addition, risers and runners would vary, sometimes risers were filled up more, and so on.

THE CHAIRMAN agreed that was very fair comment.

MR. WORMLEIGHTON pointed out one very important factor in dealing with weight calculation for estimating: if one was going to submit a price "per lb." for castings, it was necessary to adjust the calculated weight of the casting by its safety factor downwards. On the other hand, if one was going to submit a price "each" for the job it was necessary to adjust the weight calculation by the safety factor upwards. The question of the weight might have been attributed to machining allowance, but a glance at the drawing showed that all the dimensions were given in fractions, which meant that it was not a high accuracy job and therefore it would be more than ample.

Application to Small Foundries

MR. G. H. CHARSLEY, referring to the complaint made by the adjudicators that there was a lack of information as regards the time spent in the various movements of the casting from the foundry to the fettling-shop, said they had apparently expected time to be allowed for each operation. Coming from a small foundry, he found that impossible. Very often he received a call on the telephone and was asked to give a price within about a quarter of an hour, and that did not leave much time to ascertain which machines it would go on. A further point was that neither the adjudicators nor, apparently, anyone who entered the competition, had made any allowance for wasters, which probably all would agree, did sometimes occur.

THE CHAIRMAN, in reply, said he knew from experience that some founders did not need a quarter of an hour in which to quote—they could do it within five seconds. If gunmetal was required it was the price of the metal plus 1s. 10½d.; but that quick method of quoting was only a commonsense check, it was not estimation. If the overheads were applied grouped over-all, as had been suggested, then the assumption would appear to be that whatever it cost to service the moulder in every way from top to bottom of the administration, it cost just as much to service each one of the productive operators—and that was not a correct assumption.

MR. C. D. HUNTER emphasized that this was a very important point because one could arrive at a more accurate basis, not only for estimating but for real cost-control. By allocating direct expenses to the moulding, melting and fettling departments on a sensible basis, which was controlled by the man looking after that department and was also agreed by him (the latter point being most essential), one could arrive at controls which were useful in controlling his particular expenses. In addition, there was the point that he was not being blamed for something for which he was not responsible. When one had gone through all the estimating, one had a forecast of what a job should cost to make, if one kept to the standards which had been laid down. Then, in his opinion, what was obtained for that job afterwards was what could be got for it in the open market.

Concessions to Simplicity

MR. MCCULLOCH said he had been looking at the drawing (Fig. 1) and at some of the castings (Figs. 2 to 4) and had noticed that on the drawing the two bosses were round, whereas on the castings they were tapered off, which made it a much easier moulding proposition, and if he had felt inclined to tackle the problem at all he would have preferred the latter method. Nevertheless, the fact remained that the castings had not been produced as shown on the drawing.

THE CHAIRMAN, in reply, recalled the point raised by Mr. Hunter that a concession should be asked for, and said that none of those who had presented an estimate had in fact asked for one, but the moulder of the casting had asked for the concession and obtained it.

MR. WORMLEIGHTON added that the concession had been obtained in order that the job could be machine moulded.

MR. GLEGG suggested that possibly the reason for the variation in price was that the different competitors might have different ideas of mould arrangements: one would plan a mould with four patterns in it whereas another ingenious man might get five or six in it. In his firm, for instance, they would always put in a choke-runner for manganese brass, and such differences would surely have a bearing on the cost.

THE CHAIRMAN, in reply, said he was beginning to realize that he should not have made the remarks on comparative costs because it was inevitable that there should be such differences, and indeed they were not really discussing the adequate cost ascertainment but the method, and accordingly he withdrew his criticism.

Overheads

MR. W. B. KIRKUP said Mr. Hunter had rather led him to believe that he liked to base the overheads on the servicing of the various departments, whereas he understood the Americans tended to do it on floor area, but he would be interested to hear Mr. Hunter's comments on what he favoured by way of the spreading out of overheads.

MR. HUNTER said that to go back a little further than that point, if one arrived at a sensible budget of the direct labour hours required to run any department—and they could take as an example the moulding department—having pre-determined that and arrived at an assessment over a long cyclic period, then one could determine with the foreman in the shop all the services which were required to run that particular shop, where the foreman had complete control over them and they could be measured accurately. That was the *direct* expense, but anything which could not be allocated in that way was apportioned through the medium of the works general statement. All such items of expense went into a works general account and were allocated according to a pre-determined plan; in some cases it might be in respect of floor area, or it might be on the number of people in the department.

THE CHAIRMAN said he did not think it was quite correct to say that American founders used floor-space for the distribution of overheads, because they made it perfectly clear on page 18 of the Productivity Report, where they were discussing departmental overheads distribution, and the pay roll was shown distributed over the various departments. They then showed floor-space distributed over those same operations, and also the equipment distribution, and having got those three processes, it was stated "the proportion of fixed and apportioned overheads based on production labour"—and then floor-space and equipment. Naturally, the same would be done in this country, and in fact local *ad hoc* conditions would be taken into consideration because each item of expense had to be considered separately, which was the best medium of distribution to use. After all, one did not have to do it every time an estimate was made: once one had the overhead rating, then it could be adhered to until there was some marked change.

MR. COLLINS did not agree with a flat rate overhead; at his firm they had taken out the overheads for every department separately, and strangely enough had been very surprised to find that the fettling-shop had the highest overhead, due to the cutting tools and particularly to band-saws. Sometimes a man would use half-a-dozen band-saws in a day, costing about 25s. each, which, of course, bore no relationship to the work he did. If one brought in a cost accountant to arrive at the overheads on each department and the accountant either left or died and another one was called in,

Cost Clinic—Discussion

would they both arrive at the same overheads?

The weight of a casting could be calculated fairly precisely but overheads were a matter of how the thing was viewed; one man might look at it from one angle and another from a different point. In this country, overheads were calculated in a different way and by a different method in various firms, and he had not been convinced that the calculation of overheads was a precise science, like the calculation of weights.

MR. HUNTER, in reply, said he was not a cost accountant, nor indeed any other sort of accountant, so he did not have to enter into an argument. He was not going to refer to overheads because normally he did not know what they meant: what he did understand was the direct expense, and whether it was plotted on a curve, because it did not vary directly with activity, or was it indeed a straight line, or in fact was it fixed in that way for all normal operations of the company. All such expenses should be fixed on the shop floor. In consultancy work it was very often embarrassing because the whole of the cost-control facet was so constant. Not only in one industry but in fact in all the industries was used the same code of accounts throughout, and in his submission within one industry it was of extreme importance because then one got relative comparisons.

MR. BUCKLEY suggested they should now be called "manufacturing expenses," which would probably kill the old term for good and all because, after all, they were manufacturing expenses on a particular job. Having taken those out then there was a very small proportion which might be called "overheads," or by any other term.

Conclusion

THE CHAIRMAN said they had spent an encouraging one and a half hours during which it had been found that there was only one point upon which the adjudicators of the competition might be criticized. It was apparently thought that they had been a little strict with regard to the distribution of overheads, and some founders would still feel that they were entitled to their own opinion in the matter, as indeed they were. The adjudicators would go back and have a look at a few examples of what would happen if they did not departmentalize overheads in those figures which they were accustomed to use every day, and to see if the easier way which had been suggested did not embody the percentage of inaccuracy which they felt they should avoid.

MR. HUDSON, in proposing a vote of thanks to Mr. Davies for his able chairmanship and to his colleagues, Mr. Hunter and Mr. Wormleighton, in connection with the adjudication of the competition, said he had seldom been more interested in the subject of costing than during that session. The adjudicators had not only put in a lot of hard work in order to reach the decision, but they had also put over the whole subject in a delightful way.

The vote of thanks was carried with acclamation.

Record September Steel Production

Steel production in September achieved a record for that month. Output last month was at an annual rate of 17,149,000 tons, compared with a rate of 15,749,000 tons in September of last year. The previous record for September production was made in 1950, when the rate was 16,964,000 tons. Pig-iron production last month attained a new record, reaching an annual rate of 10,845,000 tons, compared with a rate of 9,854,000 tons in the corresponding month of last year. The previous peak rate—reached in August of this year—was 10,498,000 tons.

The new record steel production, the British Iron and Steel Federation states, was made possible by the expansion of pig-iron production, which has been greatly helped by the coming into operation of four new blast furnaces during recent months. These blast furnaces, which took an average of about three and a half years to build, formed part of the industry's 1946 development plan.

Latest steel and pig-iron output figures (in tons) compare as follow with earlier returns:—

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1952—August	201,900	10,498,000	279,500	14,535,000
September	208,600	10,845,000	329,800	17,149,000
1st nine months	201,200	10,464,000	303,300	15,772,000
1951—August	180,900	9,409,000	266,400	13,855,000
September	189,500	9,854,000	302,900	15,749,000
1st nine months	183,200	9,527,000	300,500	15,628,000

Engineering Unions Lift Overtime Ban

The threatened ban on overtime and restriction of piecework in the engineering industry, due to take effect on October 20, has been postponed indefinitely. Leaders of the Confederation of Shipbuilding and Engineering Unions agreed on this measure on October 1 after they had received an assurance from employers' representatives that they would seek authority to open pay negotiations with the unions.

During talks at the Ministry of Labour held earlier in the day, the Engineering and Allied Employers' National Federation, which had previously adhered to a decision that no wage increase could be conceded to the unions, even when the confederation no longer pressed its original claim for a general advance of £2 a week, undertook to obtain authority from federated associations to negotiate with the men's representatives. Previously the employers had said they would accept arbitration, which the unions had already rejected as a way out of the deadlock.

A meeting of the employers' and unions' representatives has been arranged for October 21.

The central board of the Shipbuilding Employers' Federation, which is concerned in a parallel dispute with the Confederation of Shipbuilding and Engineering Unions and threatened with the same protest action on October 20, met last Thursday to discuss the stage reached after discussions at the Ministry of Labour on October 1. Latest information discloses that at the forthcoming meeting the unions' represenatives will be given a *carte blanche* and not insist on the £2 per week rise hitherto demanded. This decision was reported to follow the relaxation of the employers' attitude which had previously been that no increase at all was justified.

Probable Trends in British Steelfoundry Practice,* and Production of Manganese-steel Castings†

Joint Discussion of Papers by F. Cousans and W. C. Meredith

The CHAIRMAN (Dr. C. J. Dadswell), in introducing Mr. F. Cousans, F.I.M., and Mr. W. C. Meredith, M.B.E., at the Buxton Conference of the Institute of British Foundrymen, said they came from a foundry which was making probably the largest tonnage of alloy-steel castings in Europe, and certainly in this country, namely, Hadfields, Limited, and therefore it was very appropriate that one of their Papers should be related to the particular steel which was developed by Sir Robert Hadfield.

In order not to give offence to founders from other parts of Great Britain, Sheffield steelfounders were much more modest than formerly and accepted that there were equally good steelfounders in other parts. Nevertheless, it was a Sheffield Conference and Sheffielders were proud to have those two gentlemen to present the papers. Mr. Cousans had a scientific background and many years' experience of foundry practice, and Mr. Meredith had worked in the foundry all his life, from first being " on the floor " to being in a position of control.

MR. F. COUSANS, F.I.M., then presented his Paper, entitled " Probable Trends in British Steelfoundry Practice," and MR. W. C. MEREDITH, M.B.E., followed with their joint Paper, entitled " Production of Manganese-steel Castings."

The CHAIRMAN, opening the discussion, said that from the two excellent foreign Exchange Papers which had been presented he had begun to feel that possibly other countries were getting a long way ahead, and it had therefore been encouraging to have from the British Authors some indication that research was being applied in this country and that improvements were being effected, although perhaps more slowly.

Catching Up with Research

MR. HALL said he had been impressed by two contrasts: Mr. Cousans had mentioned the need for trained technicians, and prior to that Mr. Dewez‡ had made it quite clear that in Belgium his own firm had established both a technical training college and a university to which were sent potential executives. Mr. Cousans had also emphasized the excellent foremanship courses which had been run at Ashorne Hill, but attention should also be directed to the thoroughly up-to-date National Foundry College, at Wolverhampton, in which at present some 20 to 30 British technicians were being trained. From what members had heard during the morning it appeared the number ought to be at least 300.

In Mr. Meredith's very fine Paper, it was stated that the major advance over the last few years had been the use of the atmospheric feeder head, but as a malleable-iron founder he would point out that the process had been in use for the past 20 years. Furthermore, the tendency in the malleable industry was to use the atmospheric feeder at levels well below the top of the casting. He had noticed that Mr. Meredith had shown relatively simple castings in which the top of the atmospheric feeder was much higher than the top of the casting. The yield of saleable metal per box could be greatly improved for the larger and more intricate castings with the atmosphere feeder placed low down in the moulding box, although care had to be taken that the casting did not feed the feeder-head.

MR. COUSANS, in reply, hoped members would not misunderstand him if he said it might be a good thing if founders were to hold up research for a year or two so as to apply to foundry practice many things which all knew about but which were as yet insufficiently applied. He himself was very keen on research and therefore somewhat of a Jekyll and Hyde in that he was torn between two desires: first, to continue with research and, second, to see a greater application of knowledge to the shop floor. In the latter sphere, founders stood in extreme need of personnel who could apply the knowledge to shop-floor practice. It was true that the National Foundry College was turning out 20 people a year, but there were 63 steel foundries, very numerous iron foundries, and a great number of non-ferrous foundries, all crying out for trained technicians. Developments were taking place so very rapidly that there was insufficiency of trained personnel to introduce them to the shop floor. The new techniques had also to be " sold " to the moulders and, in fact, greater knowledge at all levels of the industry was needed, in respect of which he was a very keen advocate of the training of supervisors.

Green-sand or Dry-sand?

MR. WELLS had been interested to see the slide showing the making of manganese crusher-jaw castings, apparently made in dry-sand, and asked at what weight or area of jaw a change was made from green-sand to dry-sand. Secondly, he had for quite a few years past been using the Washburn core (which had actually been originated some 40 years before) with a great degree of success on ordinary carbon-steel castings, and usually with like success on alloy steels, including manganese-steel, although there appeared to be more likelihood of trouble with the latter. Normally, zircon sand was used for the knock-off core itself.

MR. MEREDITH said they were making castings of up to 2½- or 3-in. section in green-sand moulds, but above that they were produced in dry-sand.

* Printed in the JOURNAL, June 26, 1952.
† Printed September 11, 1952.
‡ See JOURNAL, July 10 and 17, 1952.

Steelfoundry Practice—Discussion

There was a preference for surface-dried moulds, but present facilities were inadequate. Ultimately, his firm would cast in green-sand jobs up to 2½- or 3-in. and up to 7-in. section in green-sand skin-dried moulds. Knock-off cores were made in an ordinary sand. It was true that the Washburn knock-off head had long been known, but until quite recently it had not been used very extensively.

To give an example of its present significance, today's average yield by weight was 70 per cent. for all types of castings—carbon-steel, manganese-steel, heat- and corrosion-resisting and alloy steels. Manganese-steel and low-alloy-steel ran much the same as each other at just over 70 per cent., heat- and corrosion-resisting steels at about 65 per cent. and high-alloy steels lagged behind, though this was purely for domestic reasons, because there was no reason why a yield for the high-alloy steel castings should not be up to 70 per cent. or even higher. It was believed there was still another 10 per cent. of steel which could be saved in their foundry by adopting improved methods.

MR. SNELSON asked whether it had been possible to develop even rule-of-thumb methods which would give some guide as to the size of Washburn core for a given section. Much controversy still existed over the normal type of head and systems were by no means standardized. He did not know to what extent the work had been done on manganese-steel, but perhaps Mr. Cousans could give some indication as to the ratio of the normal-size head to the exothermic head, and the relation which that system bore to the extra size which had been prepared.

MR. COUSANS replied that development had taken place in two stages. First, there had been the development of the knock-off head. The information had been taken as recorded by Briggs in his book and a new start had been made where he finished. All development castings had been checked by X-ray examination and it had been found necessary in the case of knock-off heads to modify the size of the aperture. In stage two, Hadfields' had been indebted to the president of the Institute, Dr. C. J. Dadswell, who had first introduced them to the use of exothermic sleeves, and had very kindly told them of developments in his foundry. They were now concentrating on sleeves of exothermic material ⅛ in. thick, and were making cores in sizes of standard depths of 3 in. in order to simplify the core-making. It had been found that they could estimate very closely on a yield of 80 per cent. with great safety.

The firm was fortunate in that they had an X-ray laboratory, with radium and radio-active isotopes. They carried out experiments and made a pilot casting before going ahead with production. The pilot casting was examined in the X-ray laboratory and foundry technicians could then assess the internal soundness. That method had popularized the use of knock-off heads to the foundry more than any other way. The fact that a man could study the X-ray prints of his casting, and see the amount of shrinkage, if any, was very convincing. These techniques helped in the rapid appraisal of method developments among the personnel.

MR. SNELSON said he was particularly interested in applying exothermic heads on a rational basis in relation to the section which was being fed. Over a period, it had been possible to correlate the information from various foundries and show which was the minimum size of head for the part of the casting which was being fed, and also the minimum diameter of sleeve required for a given section, whether it was vertically or horizontally cast. To date, investigators had no information on manganese-steel, and he knew some founders used a riser twice and three times normal size. When feeding billets it was possible to go below the diameter, and up to 15 in. one could work on a two-thirds ratio, but he would welcome Mr. Cousans' comments on the subject.

MR. COUSANS replied that as far as the shape of feeding heads was concerned, his firm were in favour of making them one and a half times the diameter. As to their diameter in relation to the section being fed, that was also approximately one and a half, but it was more difficult to be dogmatic. Ultimately, it was hoped to prepare similar curves to those given in Briggs' book; all the information was being carefully drawn together by the firm's methods section, and in due course they would draw up their own diagrams and hoped to submit them to the Institute in the form of a Paper.

MR. SNELSON thanked him, and said members of the foundry industry would look forward very much to having such information.

Exothermic Powder

MR. PACKHAM said he had been very interested in Mr. Cousans' references to the use of sleeves and could confirm that an 80 per cent. yield was relatively easy to obtain. He did, however, disagree with Mr. Cousans on the extended use of sleeves because he thought the treatment of risers with exothermic material was of more interest as it would give the same yield but involved a far cheaper material and a method much easier to apply. More work should be done on that material, especially as the Americans had made castings of up to 40 tons using it. He believed founders were further ahead with such materials in America, and there was much more scope with it.

MR. DAYBELL also referred to the use of exothermic powder to which reference had just been made, and which could be applied on top of the head to reduce the height of the head required. The powder could be applied quite easily, and in his opinion was a much more practical way of obtaining advantage from exothermic material. There was then no need to worry about getting the cores made and marshalled in front of the moulder at the right time, with all the costly breakages which might occur. All that was necessary was to have the exothermic powder measured out into packets of a certain weight and applied at a given interval after the casting had been cast. There was no need to alter the equipment or to make special heads for sizes of risers different from normal; the saving was on height, and it was possible in some cases to feed

the casting almost at its own level. While the atmospheric head had been one of the major developments in the steel founding industry in recent years, in his opinion the exothermic material would rank second.

The Papers were closely allied from the technical-training point of view, and assuredly some good would derive from the point made by Mr. Dewez in his Paper when he said that technical training of foundrymen was allied more to the practical side in the first place than to the scientific side, and after it had been applied to the practical side, it could then absorb the more scientific aspects. In this country, there was a tendency to train people more on scientific lines, with the result that when they came into the foundry they were at a loss to apply their knowledge in a practical way, and there was a definite advantage in reversing the system.

MR. COUSANS, said, with regard to exothermic powders, that it should be remembered that Hadfields were largely alloy steelmakers, and it would be rather disastrous if they were to get a material well down into the casting which was not of the same composition as the parent metal. Thus they had tended to develop the use of exothermic sleeves rather than make extensive use of exothermic powders. Hadfields were casting steel during a 24-hr. day, and good as their control might be it was not good enough and there had been cases where the exothermic powder had not been applied at the right time and there had been a number of failures, and so they had concentrated more on the use of exothermic sleeves. In all such developments, one needed to be objective and to do what was best under specific conditions. At the moment he was more convinced of the efficacy and possibilities of exothermic sleeves than of exothermic powders, but he was still open-minded about it.

Founders needed scientific thought at all grades; they needed the pure scientist who could wander around the foundry and see the problems as only that type of brain could see them; they needed the scientist who had a technical background but with a leaning towards the practical side, and they also needed to put a greater amount of knowledge in the hands of the foreman and charge-hands. In addition they should not be afraid of interesting workpeople. For instance, in his own firm, they were quite prepared for all information on sand to be passed to the practical men and in fact encouraged it, as doubtless others did. By those means founders would undoubtedly raise the general quality of castings produced.

MR. KEEBLE thought the lecturers were to be congratulated on the "yields" obtained so consistently with their castings, but probably all appreciated that a yield must be related to the average weight of the castings. Obviously, if one section worked on castings having an average weight of three tons and another section worked on castings with an average weight of three hundredweights or yet another on three pounds it altered very considerably the significance of the yield percentage, so perhaps members could be told the average weight of castings to which the yield figures applied.

Secondly, he would like to know the Authors' views on the use of the atmospherically-vented feeder head, without the "cracker" core.

Age Groups

Thirdly, in his view the greatest need of the industry at the present time was to get the intermediate supervisory staff into the right attitude of mind towards techniques and towards production generally. In age, supervisory staffs ranged from thirty to sixty-five, and in the former group they had a batch of men who had been reared on full employment—the cutting factor of competition had not been present—while in the latter group there were men who had always, by dint of hard experience, played safe in their approach to new techniques. The biggest need at the present time was to get the supervisory staff production-minded, cost-conscious and interested in human relations, and then they would get the men actually on the shop floor following them quite happily.

MR. COUSANS said that the average weight of castings could be a misleading figure, because his firm made them from a few ounces up to about 30 tons, and the figures were average over several weeks; they were not his own figures, but had been supplied by independent accountants.

With regard to the need for training the intermediate grade of supervisors he entirely agreed with what had been said, and that was why, in his Paper, he had endeavoured to stress the "training within industry" course of the Ministry of Labour and National Service, in which supervisors were encouraged to acquire the three skills of instruction, of human relations, and of job improvement. In his own organization, great benefit had been derived from those courses, but much more was required.

The atmospheric feeder head without the cracker-core had been found quite unreliable. When it was applied to manganese-steel casting, there appeared to be a fairly sound burn-off, but on X-ray examination internal shrinkage was frequently found.

Practical Leanings

The CHAIRMAN (Dr. Dadswell) said members should not forget that the primary training school for foundrymen, the National Foundry College, insisted that the men should have practical training before going there. In the same way, the French Foundry School, to which he had had the pleasure of going, made it a condition that the pupil had to work in the foundry for 12 months. Often, of course, it meant that a man had some technical training in metallurgy or engineering, then went into the foundry to get his practical experience and then to the foundry school for what might be termed a post-graduate course.

Vote of Thanks

MR. HANCOCK, in proposing a vote of thanks to Mr. Cousans and Mr. Meredith, said adequate words were always difficult to find when it was desired to express the pleasure it had been to have such an enjoyable time as members had experienced that morning. He did not think that any one of them who had his heart and his mind on

the problems of steelfounding could have found a time which had passed more quickly and in which the questions arising in one's mind had been so promptly asked by questioners and so adequately answered by the lecturers.

MR. OTTIGNON, in seconding the vote of thanks, said they had enjoyed a varied discussion on the subject of training and the mixture of craft and scientific training, and he thought the two lecturers had given a very interesting practical example of both the craft and the scientific side. He had been rather shaken when Mr. Meredith had referred to 50 years in a steel foundry, because he did not think steelfounders lasted that long! However, some of the younger members would feel relieved that there was a reasonable prospect of life in front of them, and it was certainly an exceptional experience to have a Paper from men of such long standing in the industry.

MR. MEREDITH, replying to the vote of thanks, said that owing to his long experience in the foundry, members would realize what he was now up against; he had the old tradition ground into him, but he had seen a lot of alterations during the last few years and he had to try and keep pace with them. During the discussion, one outstanding thought had struck him, and he hoped that by voicing it he was not throwing a spanner in the works! He fully agreed with progress—it must come and it had to come because one could not stand still, but he sometimes thought there were entering into the foundry industry men with academic careers, and the ill-effect which they created took a lot of rubbing out. He would like to urge the National Foundry College to impress upon students that they must make sure when they were appointed to a shop that they were somebody and were going to do something; at the moment, the industry was getting too many "tellers" and not enough "doers," and if some could be both "tellers" and "doers," much progress would be made.

MR. COUSANS added his acknowledgment of the vote of thanks.

WRITTEN COMMENT

MR. S. L. FINCH (Catton & Company) wrote: In outlining future trends in steelmaking the Authors have pointed out the possible use of synthetic slag in the basic electric furnace in order that the deoxidation period can be reduced. Would it be a greater advantage to insert induction coils in the hearth of the furnace in order that an increased rate of circulation of the bath may be obtained, thus increasing the slag/metal interface reaction and as a consequence reducing the deoxidation time cycle? In the survey of the converter process, does Mr. Cousans consider that patching of cupolas, even by the use of patching guns, will be considerably reduced in future years by the introduction of water-cooled cupolas?

With regard to sand practice, the use of fine sands has been adopted on a considerable scale in Great Britain, but many native fine silica sands contain a relatively high percentage of basic materials and as a consequence there is a tendency to fusion, although a reduction in metal penetration takes place. Furthermore, the sand practice in this country must eventually take into consideration the use of some form of wet-reclamation unit thereby eliminating a tremendous wastage of moulding sand. If such a wet-reclamation unit can be designed, to return to the system more than 90 per cent. of the initial additions of sand, is it possible that the use of zircon sand will become an economic possibility?

Feeding Heads and Plastic Patterns

For some time, the writer has been interested in the use of plastic materials for the production of mulitple patterns and would be pleased if the Authors could enlighten him as to whether his Company has any experience of this method of pattern production and whether there is a possibility of these materials replacing equipment already made in light alloys. It is most pleasing to read the opinion that core-blowing will be extended to jobbing work and indeed this has been done to a certain extent. However, as yet the industry has not fully explored the use of jolt-roll-over machines for this purpose.

The Authors' illustrations show what excellent advantages are to be obtained by the use of exothermic sleeves. These advantages are increased yield and reduced areas for cutting and grinding, but is it correct to say that when the total cost of the material required, labour and handling charges are fully assessed, the saving in liquid steel in many instances is lower than the total cost of such items? Would it not be true to say that the use of exothermic sleeves has, as regards economics, a limited field of application, *i.e.*, in the higher weight range? If this be true, could the Authors indicate at what size of head the exothermic sleeve becomes uneconomical to use? Secondly, in the writer's foundry they have endeavoured to utilize this method of increasing head efficiency, but results have been most inconsistent. Did the Authors come across similar trouble in the early stages of development, and, if so, might one have advice as to the ways in which the efficiency of this material has been stabilized?

Finally, with regard to increasing feeder-head efficiency, was it possible to develop the use of cheap insulators? Some of these insulating materials were relatively cheap, and, when used intelligently, showed considerable saving in head metal and also a substantial decrease in the total cost of production.

MR. J. E. R. TOMPKIN wrote: First may I congratulate the Authors on what was to me one of the most interesting Papers of the Conference. As one whose experience has chiefly been found in the cast-iron field, I am perhaps a little previous in attempting to discuss feeding of castings with steel founders. However, as I have had some little experience in the application of exothermic feeding to press-slide castings weighing from 1 to 10 cwt.,

I may perhaps be able to add some helpful remarks. Experiments carried out on these slides may throw some light on the question of superiority of either the sleeve or powder method (*i.e.*, the exothermic mixture applied at the top or bottom of the feeder head. The slides in question were fed by a spherical feeder head, formed in two half-cores, the joint being horizontal. On a specific slide the following results were obtained by variation of the material of the cores. ("Efficiency" was calculated on the assumption that a feed-head with no metal remaining in it would be 100 per cent. efficient.)

Material.		Efficiency, per cent.
Top half-core.	Bottom half-core.	
Silica sand	Silica sand	27
Exothermic mixture ..	,, ,, ...	40
Silica sand	Exothermic mixture ..	31
Exothermic mixture ..	,, ,, ..	38

Thus, although I consider that the "core" type of exothermic mixture far superior to the powder, I feel that its application towards the top of the head is more desirable.

As a further illustration of this, I have recently been applying the "core" type of material as a ¼ in. thick biscuit to the top of a flat-top feeder, and results have been superior to those obtained on the same castings by use of an atmospheric feeder of the same size. Illustrations, both of the slides and feeders mentioned, were printed in the FOUNDRY TRADE JOURNAL, April 5 and July 5, 1951.

Authors' Replies

The AUTHORS replied that they were indebted to Mr. Finch for his contribution to the discussion and for a number of very interesting suggestions made. In their view, any method which resulted in a better mixing of slag and metal was likely to speed up the steelmaking reactions and the suggested use of induction coils in the hearth of a furnace appeared to be well worth a trial. The use of water-cooled cupolas was likely to be developed as a feature of the cupola/converter type of steelmaking unit in the future and no doubt the basic-lined cupola would also be the subject of experiments and development; the latter process offered great advantages in the production of low-sulphur metal.

It was true that some of the finer sands contained appreciable quantities of alkaline salts, but there were available fine silica sands which were relatively free from these constituents and which have given good and consistent results over many months when used for green-sand mould production. The "wet" system of sand-reclamation would undoubtedly be developed, but it should not be overlooked that most if not all of the clay bond would be lost in such a practice. The results of trials of plastic patterns and coreboxes certainly suggested that they were a reasonable alternative material to light alloys and to date they had proved quite feasible.

The Authors were interested in Mr. Finch's query as to the economic advantages resulting from the use of exothermic sleeves, and naturally had the same doubt in their minds when first exploring the practice. In their view, there was no hard-and-fast rule as to the size of head when the exothermic sleeve became economical, because of the wide variety of steels used; each job had to be judged on its own merits. They agreed that sufficient use had not been made of cheap insulators (such as ordinary floor-sand containing an addition of sawdust). They had a number of failures in the use of exothermic sleeve cores, but by patient recording and study of the data obtained, they had now worked out a practice which was giving reasonably good and uniform results, but, as mentioned earlier, one could not apply the standards found satisfactory for, say, manganese-steel to other alloy steels or to carbon steel.

Mr. Tompkins' remarks were very interesting, and especially his use of a spherical feeding head. The Authors had obtained very satisfactory results from feeding heads of that shape, but had not found it necessary to use puncture cores, as the heads became naturally punctured as the steel drained away. It was agreed that the exothermic sleeve was more efficient when applied towards the top of the head.

House Organs

Ruston News, Vol. II, No. 43, published by and for the employees of Ruston & Hornsby, Lincoln and Grantham. Price 1d.

This seems the only house organ arriving at this office which is published weekly. The issue under review contains a message from Mr. W. J. Ruston, the chairman of the company. Amongst the news reported is a presentation to Mr. McGlashan, until recently works manager at Boultham Works, on his retirement. The sporting activities of all sections of this great engineering and foundry enterprise are fully reported.

Albion Works Bulletin, Vol. 6, No. 6, issued by John Harper and Company Limited, Albion Works, Willenhall, Staffs.

This issue announces the creation of a Pensioners' Club, carries a progress report from the Poole Works, prints an obituary notice of Mr. T. W. Taylor, who was the firm's cashier for 30 years; and records the election of Mr. W. Wakeman as chairman of students' section of the Birmingham branch of the Institute of British Foundrymen. The various shops contributed £60-odd to the Lynmouth Flood Relief Fund, whilst the firm added a further 25 guineas. This bulletin does give an excellent record of the firm's activities which will be of great use to historians in the future.

The Boncaster. Published by Bonnington Castings Limited., Bonnington Road Foundry, Leith, Edinburgh. Vol. I, No. 1.

This is the first edition of a house organ designed to interest the employees of the "Edinburgh Group" that is the above works, Primrose & Company, Limited, Balbardie Limited, and their associates, the North British Steel Foundry Limited, of Bathgate. It announces the receipt of a £250,000 order for steel castings—possibly the largest order ever placed with a Scottish steel foundry. There is a report of a visit to Catton & Company of Leeds and as is usual with this type of magazine, accounts are given of all the social and sporting activities of the "Group."

Allied Ironfounders' Exhibition

Allied Ironfounders Limited, who manufacture, to the Egerton standard, space-heating, water-heating and cooking appliances, baths, rainwater and soil goods, have now assembled, for the first time, at 28, Brook Street, London, a permanent exhibition of products of household equipment. The object of this exhibition is to make a permanent contribution to the nation's knowledge of space-heating, water-heating and cooking. Planned to be of special interest to architects, builders' merchants, officials of housing authorities and local councillors, and students of building and architecture, the latest products of the modern foundry are displayed in varied and interesting settings. Here, under one roof, can be seen an unusually wide range of appliances. One of the most interesting sections is that devoted to the history of ironfounding and a picture of the section is reproduced here

West German Steel Supplies

Supplies of steel to the West German home market have improved considerably over the last few months, and are expected to expand further by the end of the year.

The rate of import of iron and steel products has also shown a marked increase following the freeing of the West German steel price and the removal of customs duties. Considerably larger supplies have been offered from the Saar and France at prices appreciably lower than those of previous imports from Belgium. The monthly average of imports was 13,500 metric tons in the first six months of this year. Total import orders placed have now risen sharply to 750,000 tons, and imports are expected to average from 120,000 to 140,000 tons a month for the next few months. If monthly deliveries from home production are taken at from 800,000 to 840,000 tons, total deliveries of steel to the German home market should be at the rate of nearly 1,000,000 tons a month by the end of the year.

"Industrial Relations" Course

The Institute of Personnel Management is holding a five-day residential study course on "Industrial Relations" at the Regent Hotel, Leamington Spa, commencing on October 27. The course is designed to be a serious contribution to an undertaking's training plan for its personnel staff and is for those who already have some knowledge and experience of industry, management, and human relations.

Similar courses have been planned by the institute as follow:—"Welfare Services and Working Conditions," London, November 30-December 6, 1952; "Employment," London, January 11-16, 1953; "Staff Management in Retail Distribution," London, February 8-13, 1953; "Wages," London, March 8-13, 1953; "Industrial Relations," Glasgow, April 12-17, 1953; "Education and Training," Leamington Spa, May 8-13, 1953; "Staff Management in Offices," London, June 7-12, 1953. Details may be obtained from 8, Hill Street, London, W.1.

Japanese Blast Furnaces for India?

Recommendations have been made by the Japanese steel industry that Japan should move its idle blast furnaces to India to speed up the production of steel in that country. It has been pointed out that about 45 per cent. of the total number of blast furnaces in Japan are not working at present, and that it would be quicker and cheaper to remove these to India instead of erecting new ones.

It is estimated that Japan's steel industry would not be able to compete with foreign steel manufacturers on a level footing, even if the industry rationalized itself, because of the handicaps of freight charges and transportation of the required raw materials. Japan's steel industry, a report by Mr. Takuo Godo (a former Minister for Industry) stated, must find access to cheaper raw materials. At the present the best way seemed to be the importing of Indian pig-iron, which would cut down transport costs by about one-third.

Speedy Delivery

A race against time recently reached a happy conclusion on Tees-side. A local firm, the Anderston Foundry Company, Limited, of Port Clarence, on the north bank of the Tees, was offered a "rush" order for 375 tons of steel sleepers for shipment to Dar-es-Salaam. But it was a condition of sale that they were to be shipped by a steamer due to sail from Birkenhead on Monday, October 6.

Production of the consignment was only completed on the Saturday, but previous notice having been given to the railway officials at York, they were loaded on to a special goods train of 36 wagons the same day and are now on their way to their final destination.

BRITISH AUTOMATIC COMPANY, LIMITED—Mr. Frank Leslie Timmins, general manager, has been elected to the Board, and has been appointed assistant managing director.

Notes on Cupola Operation

By A. G. Gardner

This article briefly reviews a number of practical operational details which represent the application of past experience. It is suggested that the optimum use of these established principles should lead to more efficient cupola operation.

With the rearmament programme fully under way, foundries in this country are meeting again many of the problems which were encountered during the last war. These included shortages of pig-iron, good scrap, good melting coke, and man-power. The quality of castings which will be demanded is, however, likely to be higher, and specification limits will probably be closer. The need will therefore be for greater efficiency from present equipment.

Importance of Raw Materials.—Whatever the improvements aimed for by other means, results in cupola practice depend to the greatest extent on the kind of raw materials employed. Cupola materials are scarce and the best quality available should be insisted upon. Due care should then be taken to make the most of these materials by accurately measuring everything, including blast-pressure, metal charges, coke and flux. The size of scrap, pig-iron and coke charged should be considered in relation to the size of the cupola. Pig-iron and scrap are recommended to be no larger than one third of the inside diameter of the lining, whilst the coke should be limited to one twelfth of this diameter. Uniformity in size and composition improves the final results. The height of the charged column should be great enough to take full advantage of the heat in the hot gases and this will vary between 13 and 20 ft. above the bottom plate depending on the size of the cupola.

Proper Lining Practice.—This factor is one which can influence quality of results as well as cost, and the use of high-grade refractories will prove more economical in the long run. Whenever possible, the best practice is to run cupolas on alternate days and so carry out regular repairs. These should be done as uniformly as possible so as to obtain consistent metallurgical control. The blast will be found to penetrate further into the melt if the amount of lining-overhang at the tuyeres is increased somewhat beyond normal, particularly when small coke is used. The use of a basic lining is now well recognized in yielding iron of lower sulphur content, especially when high scrap mixtures or poor-quality coke have to be used. If one side of the lining has been attacked more than the other, the size of the main tuyere hole opposite should be reduced.

Improving Blast Control.—Lack of control over the amount of the blast has led to difficulties in some foundries in the past, particularly in the case of the ordinary fan-type blowing equipment. When the fan meets increased resistance or even when atmospheric temperature and barometric pressure fluctuate, the volume of air delivered can vary quite markedly. This tends to produce corresponding variations in the quality of the metal. A fan should have at least an ammeter or watt-meter on it, but better still is equipment which controls the actual amount of air entering the cupola. The blast system should be examined from time to time in order to check whether there are any leaks which would lower the efficiency of any blast control apparatus.

Correct Tuyere Height.—This is an important factor, especially with cold-blast cupolas, since there is a low-temperature zone in front of the tuyeres. The higher-melting-point slag components will tend to freeze in this area and can seriously reduce the flow of air through the tuyeres. The slag which collects in the cupola well should never rise into the low-temperature zone, and this is avoided if it is ensured that the tuyeres are high enough. Rear slagging is employed on many cupolas and the tuyeres should then be so placed that a clearance of approximately 5 in. is allowed between the slag-hole and the bottom of the tuyeres, without lowering the capacity of the well.

Good First Tap

The first portion of the day's melt is often too " cold " to be used. This waste of metal can be prevented. The conditions under which the " cold " metal occurs usually arise because partially-ignited coke lies on the cupola bottom and has to be heated by the first iron which is melted. With wood ignition, sufficient wood should be used to ensure that only completely-ignited coke drops through to the bottom. This is best accomplished as follows. The first one-third of the coke bed can be ignited and burned to a good " yellow " heat outside the cupola. This fully-ignited coke is then dropped into the cupola, another one-third added and a mild moderate blast is used for several minutes. The remainder of the bed is added when a " cherry-red " heat has been obtained. The burned-in coke bed should come to the same level each day in order to maintain constancy of metal. The height of the bed can be stated to vary with the square root of the blast pressure.

Preparing the Charge

Charging methods used in this country vary from hand-charging, through stages of partial mechanization, to full mechanization when two or three men handle an operation formerly done with six to ten times that number. A fully-mechanized method, besides reducing labour costs makes for greater

Notes on Cupola Operation

uniformity of operation, greater accuracy in weight of charges and generally better control of the whole cupola operation.

A yard crane in conjunction with a hanging steel-ball is useful for breaking up large pieces of scrap to cupola size. Correct sizing of the melting stock has been mentioned earlier. This prevents arching of the charge in the cupola, which lowers efficiency and metal control. When charges descend at uniform speed the greatest metallurgical control is possible and fuel consumption is at its minimum.

Weighing apparatus used for making-up the charge should be maintained in good mechanical condition with a reasonably high accuracy. The men using the scales should then ensure that all their weighings are correct. Unequal distribution of stock in the cupola is to be avoided. Heavy material passing down one side of the cupola and light material down the other causes bridging and unequal blast resistance at some tuyeres. Such conditions of unbalance give inefficient operation and poor metal control. Materials which are charged symmetrically in a cone-bottom bucket will also be distributed symmetrically in the cupola. This means fluxing action will be uniform and all tuyeres equally free for entry of the blast. The charge density is greater at the periphery, which results in more uniform blast penetration and consequent greater melting efficiency.

Control Items

Carbon. — Steel additions provide the usual method of controlling carbon content. However, it should be remembered that carbon absorption also depends on the length of time of contact between metal and coke in the cupola well. A deeper well will increase this time and result in an increased amount of carbon in the iron.

Advantages of Hot-blast.—Hot-blast is of especial use where large tonnages of metal are melted over long periods of time. Hot-blast equipment results in hotter, better-quality iron with reduced coke consumption. There is the added advantage of scarcely any bridging at the tuyeres, which means easier maintenance of metal temperature.

Moisture.—The amount of water-vapour in the atmosphere varies fairly widely with weather conditions. It is occasionally desirable to control the moisture content of the air blast. This can result in some saving in coke and reduce losses of such elements as silicon and manganese.

Duplexing.—Purchased scrap is often of rather variable composition, especially in these days of metal shortage. This leads to the metal from the cupola being of a more variable composition. The installation at the cupola spout of pulverized-coke-fired hot-metal mixers or electric furnaces of greater mixing capacity than those at present used should give more uniformity and allow adjustments to be made in metal composition.

RENSHAW FOUNDRY LIMITED of Mill Mead, Staines, Middlesex, announce that their telephone number has now been changed to Staines 4261-2-3.

Corrosion Problems

Problems associated with all forms of corrosion are under constant investigation at the Chemical Research Laboratory, Teddington, of the Department of Scientific and Industrial Research. The laboratories held a series of "Open Days" recently and featured much of the work in progress. The laboratories are concerned with all aspects of corrosion, microbiology, inorganic and organic chemistry, and radio-chemistry. Little new work was reported on corrosion problems of cast-iron water-mains, but much research is going forward of indirect interest to founders.

The effect of metal mass on corrosion in sheltered outdoor conditions is being studied. The mass effect and, therefore, the effect of heat capacity of metal specimens in the deposition of moisture and the rate of corrosion in sheltered outdoor conditions where the relative humidity can vary is under investigation.

Tests have been devised for standardization of metal phosphate coatings. They comprise methods for determining the amount and composition of the coatings, their water content, hygroscopicity, absorption and corrosion resistance. Coatings of zinc, manganese and iron phosphates are used industrially as a basis for painting.

A new accelerated atmospheric corrosion test has been devised, using a totally enclosed "Weatherometer." Built from Perspex and stainless steel, the "Weatherometer" design allows for the application of accelerated weathering in the form of sprays, ultra-violet light and infra-red drying. After each weathering cycle, on the perimeter of a rotating turntable, the specimen panels are automatically turned round to expose both sides. The annular rotating specimen rack enables the whole batch of specimens (about 40) to be transferred from one "Weatherometer" to another, if desired. There is an automatic control to give any desired percentage and sequence of spray, infra-red and ultra-violet. Among other projects, oxidation of iron and steel at 500-650 deg. C. is being studied especially in relation to corrosive flue gases; the use of sodium benzoate and other metal benzoates as corrosion inhibitors in water and aqueous solutions is being investigated and radio-active tracers are now being used in conjunction with this work.

MARKHAM & COMPANY, LIMITED, Chesterfield, have plans in hand for rearrangement of their factory buildings.

AFTER SEVERAL MONTHS' WORK, cutting and raising to the surface gun turrets and conning towers from remnants of the German Grand Fleet at Scapa Flow, salvage experts have returned to the Clyde. Salvage operations will be resumed next spring. This summer's operation has yielded over 2,000 tons of scrap.

W. EDWARDS & COMPANY (LONDON), LIMITED, of Worsley Bridge Road, Lower Sydenham, London, S.E.26, announce the opening of a new establishment at 44, West George Street, Glasgow, where they now have facilities for technical sales and service to meet the growing interest in Scotland in high-vacuum applications.

Grain Refinement of Non-ferrous Castings*

Discussion of Mr. G. Swinyard's Paper

When this Paper was presented at the Buxton Conference of the Institute of British Foundrymen, many practical points arose in the discussion, of which what follows is an abridged report. Topics included the use of metallic lithium; the importance of dryness of additions; effect of iron; three-directional appreciation of the grain-refining operation and advantages accruing, as well as the limitations of the various processes.

MR. J. L. FRANCIS said the Paper was very interesting and valuable, particularly with regard to the attention paid to the grain refinement of copper alloys; there was, indeed, a notable absence of data published on this subject. Quite recently, work of a practical nature had been carried out on Monel and cupro-nickel alloys using small percentages of metallic lithium as a degasser and deoxidant. Apart from the recording of higher mechanical properties in the lithium-treated melts, it was ascertained by micro-examinations that marked grain refinement had also taken place. Lithium was not mentioned by the Author of the Paper, but the speaker would be glad to learn if Mr. Swinyard had any comparable experience or had, in fact, made any tests. Regarding the use of degassing and grain-refining media, particularly with regard to aluminium- and magnesium-base alloys, where it was found advantageous to introduce boron, titanium, etc., in the form of salts, the dryness of the material was a most important factor. Not only must moisture be excluded during the manufacture but one should also guard against subsequent pick-up of dampness. This involved special precautions in preparation and packing.

Copper-base Alloys

MR. D. C. G. LEES said that towards the end of his Paper Mr. Swinyard discussed the grain refinement of copper alloys, referring particularly to tin bronzes. It had been known for some time that a certain grain-refining action resulted from iron additions, but he asked whether this element had any appreciable effect on the tensile properties of the bronze.

Mr. Grand, in his Paper† to the Conference stated that beryllium-bronzes could be grain-refined when boron, zirconium or titanium were added in much smaller quantity than the 0.25 per cent. iron mentioned by Mr. Swinyard. Parenthetically one might point to the fact that two of these elements were grain refiners in aluminium, although Cibula's work suggested that this parallel should not be pushed further. Could it be that any of these three elements would refine the grain size of tin bronzes? It was a virtue of the work of the British Non-Ferrous Metals Research Association on the mechanism of grain refinement by nucleation, that it showed that founders must often think in terms not only of the basis metal (in this case copper) and the element specifically added, but also of third elements; carbon, for example, proved to be significant in the grain refinement of aluminium alloys by titanium. Could it be that Mr. Grand in preferring boron had an unsuspected third element up his sleeve? Perhaps it was beryllium itself.

There was reference in the Paper to the addition of zirconium to magnesium alloys and the Author favoured the use of a fluoride salt of zirconium. This, he believed, was in harmony with British practice in general, but in a recent paper given to the American Foundrymen's Society, W. P. Saunders and F. P. Strieter of the Dow Chemical Company, the authors preferred hardener alloys made *via* the chloride. MR. SWINYARD's views on this would be valuable and Mr. Lees said he would appreciate comments on the statement that even with this hardener alloy only 0.7 to 0.9 per cent. soluble zirconium appeared in the alloy when the nominal addition was 3 per cent. in an alloy containing 5 per cent. zinc.

Grain Refining of Bronze

Of copper-base alloys, MR. SWINYARD said he was not in a position to say exactly what was happening at the moment. He would have to wait for publication of the results of experimental work. Copper-base alloys and aluminium had been regarded as sections apart in the foundry, but it now appeared they could in many ways be considered in the same context. It might be discovered that titanium and zirconium could be used with advantage in both alloys. Some advantage might result from the use of the hardener mentioned by Mr. Lees. Further judgment on the success of the technique could only be passed after detailed practical evidence. Economics might have a bearing on the matter.

Everything, he said, should be considered to make things easier for the foundries without technical staff to add grain-refinement elements. The question on the suitability of zirconium could best be answered by reference to the Paper by O. J. P. Ball in which the solubility of zirconium at 830 deg. C. was stated to be 0.8 per cent. The addition of iron to tin bronzes would not affect the mechanical properties significantly.

MR. A. LOGAN said that the need for and practical advantages of a fine-grained material was

* Paper printed in the FOUNDRY TRADE JOURNAL, June 19, 1952.

† Sand-cast Beryllium-bronze, printed in the JOURNAL, September 18, 1952.

appreciated by most foundrymen. Generally speaking, there was better feeding during solidification, less risk of intercrystalline cracking immediately after solidification, and improved physical properties in the final casting. The Author had reviewed the practical methods of grain refining available, and whilst the grain refining of light alloys had ceased to be a problem, it would be agreed that grain refinement of bronzes had lagged behind that of light alloys. So far as aluminium alloys were concerned, it was now known that the addition of two grain-refining elements was more effective than a correspondingly much larger amount of one only, and suitable compounds of titanium and boron were now available which produced satisfactorily small grain size. Two additions had been made to copper-base alloys, and the result of iron and phosphorus additions to gunmetal was summarized in Table I, and illustrated in Fig. 3 of the Paper. These interesting results tended mainly to show the dominating effect of casting temperature. Additions of iron and phosphorus were definitely limited because of the disadvantages arising when larger amounts were used, and he must inevitably arrive at the conclusion that there was not yet available a satisfactory grain-refiner for bronze. This was rather strange, for bronzes had been cast for 3,000 to 4,000 years, whereas with light alloys, which were only about 50 or so years old, the problem had been successfully solved. It was to be hoped that much more attention would be focused on the grain refining of bronze, and this Paper would have served a very useful purpose if it achieved this result.

MR. BRACE thought that elements which give grain refinement in aluminium might also be expected to produce it in magnesium and copper-base materials since the atomic diameters of the three metals were close to each other. There was a possibility that, in refining, magnesium carbides gave grain refinement through the presence of aluminium carbide (Al_4C_4). On a damp day there was a smell in a magnesium metal store which suggested the formation of acetylene. Carbon pick-up was likely, since most foundries used oil-fired furnaces for superheating and there would be a certain amount of carbon in the atmosphere at the time. He suggested that superheating magnesium in an electric furnace might not produce grain refinement.

MR. SWINYARD thought this was highly probable, but that it might not be only the oil-firing which caused carbon pick-up but also decarburization of the steel or iron pots at high temperature.

Disadvantages of Large Melts

MR. JAY asked if the Author or any members present had any experience of the addition of titanium and boron as hardeners for grain refinement. He had tried such additions to a 5,000 lb. melt, but there seemed to be considerable difficulty in retaining the boron. No such difficulty had been experienced with small melts.

MR. SWINYARD thought this was a very large melt—in fact larger than he had ever experienced. He repeated that not every foundry could afford a highly-trained technical staff and suggested (to make things easier for the practical foundryman) the addition of titanium and boron and salts in tablet form. The hardener was probably lost in the dross in the large melt, and in this case it was not a scientific method for making the addition.

Boron Trichloride

MR. LEES referring to the American Foundrymen's Society paper on boron trichloride dealing with the effect in the heat-treatment of magnesium, asked if gas bubbling from compressed-gas cylinders was useful.

MR. WEISS said boron trichloride had been tried in this country. It was a very difficult process and had now been withdrawn. It had been introduced in America and had also been withdrawn there.

MR. SWINYARD said that the bubbling of gas would have to be made a practical proposition. There might be a danger that boron would not be effectively transferred as was found to be the case in magnesium alloys when carbonaceous gases did not yield the necessary amount of carbon to cause grain refinement.

Mr. Swinyard was asked what he considered was the best addition for grain refinement in copper/nickel alloy (say 4 per cent.) He was further asked for comment on the fact that most English users of phosphor-bronze did not like the addition of nickel, but of course American specifications included it. He agreed that nickel did tend to cause a more even distribution of the eutectoid in bronze but suggested that Mr. Hudson was more able to comment on the question.

MR. HUDSON pointed out that it was dangerous to draw comparison without all available information. In America, engineers used nickel in bronzes extensively; British engineers did not.

TEN 15-TON LORRIES laden with rollers, for a 1,000-ton sugar cane crushing mill, left the works of George Fletcher & Company, Limited, Masson Works, Litchurch, Derby, *en route* for Liverpool, on October 1. This is part of a million-dollar contract for crushing plant and processing equipment. This consignment will be shipped to the San Dominican Republic.

TEA has not only been in the news nationally but Mr. W. G. Tucker brought it into his presidential address to the Birmingham Metallurgical Society as well. Mr. Tucker, who is in charge of the foundry and casting department at I.C.I. (Metals) digressed from the study of metals to an observation on the men who work in them. He had noticed, he said, a decided change in the foundry caster's drinking habits in the last 30 years, and was impressed by the caster's diminishing need for alcoholic refreshment. In the days of pit casting, beer was considered a necessity; to-day, a bottle in a casting shop was a rarity. The huge jugs remained, but, although he believed that successive Chancellors of the Exchequer had much more to do with it than social reform, the jugs did not contain ale, but only tea—strong, sweet and brown.

Institute of Vitreous Enamellers

Annual Conference in London

From Wednesday to Saturday last week the annual conference of the Institute of Vitreous Enamellers was held in London, with headquarters at Charing Cross Hotel. Members assembled on the evening of October 8 and committee meetings were then held. On October 9, the proceedings commenced with the annual business meeting at which, following the minutes of last year's Birmingham meeting, the report of the Chairman of Council, Mr. S. Hallsworth, was read and, subsequently, the financial statement, auditors' report and treasurer's review were presented by Mr. W. S. Grainger. These revealed a satisfactory financial position for the year under consideration by disclosing a small favourable balance of income over expenditure after placing £150 to the research fund and despite increased administrative charges.

The next item was the election of the new president, when the president-elect, Dr. Harold Hartley (chairman, Radiation, Limited), was duly confirmed in office and inducted to the chair by the retiring president, Dr. J. E. Hurst. A pleasing precedent was observed this year, for, after his induction, the new president formally invested Dr. Hurst with a past-president's medal. This was a small replica of the president's insignia, bearing the year of office.

Following the re-election of Mr. W. S. Grainger, as honorary treasurer, the result of the ballot for council members was announced as Mr. A. Biddulph and Mr. S. Hallsworth, re-elected, and Mr. H. Whitaker, newly elected. Next, after a short interval, Dr. Hartley read his presidential address, for which he took as his title "Domestic Gas-appliance Manufacture and the Vitreous-enamelling Industry in Great Britain"; this, in common with the technical contributions to the meeting, had been preprinted and circulated to members in advance.

Visits and Technical Sessions

On the Thursday afternoon, visits were paid by parties of members, alternatively to the foundry, enamelling and assembly shops of Belling & Company, Limited, electrical appliance manufacturers, of Enfield, or to the Watson House premises of the North Thames Gas Board, where tests on vitreous-enamelled gas appliances were a feature. As part of a special programme, the ladies attending the conference paid conducted visits during the period to the City of London and to the Cadby Hall headquarters of J. Lyons, the caterers. The visit to the City included the viewing of the Goldsmiths' Hall, where a talk on the company was given and both historic and modern plate was examined. Later the party went to the City Livery Club, Zion College, and tea was served.

Friday morning and afternoon were devoted to technical sessions at Charing Cross Hotel. At the morning session two papers were presented and discussed:—"Silica-free Enamels," by Dr. B. K. Niklewski and Mr. R. H. Ashby, and "Refractory Materials for the Vitreous-enamelling Industry," by Mr. R. J. Slawson and Mr. J. F. Clements. The afternoon was given over to consideration of cast-iron enamelling; first, in a paper by Mr. H. M. Hibberd entitled "Production Methods in the Enamelling-shop" and, secondly, by discussion of an interim progress report of the sub-committee delegated to inquire into cast iron for vitreous enamelling. These last were complementary, and lively discussions followed each contribution.

A final technical session was held on the Saturday morning at which an open forum was held to discuss members' problems. This resolved mainly into further detailed consideration of cast iron for enamelling. Mr. John Gardom, who presided over the informal proceedings, first announced the provisional date of the Institute's Spring Meeting, 1953, as May 13 to 15 at Buxton, Derbyshire. At this meeting it was expected that members of the British Ceramic Society would be official guests to comprise a joint meeting.

Discussing the provision of cast-iron components of improved quality suitable for enamelling, the chairman called for suggestions as to how the sub-committee's work could best be prosecuted in the light of the statistic's newly collected. Official invitation to members of the Institute of British Foundrymen to join that of the Enamellers was put forward, as well as improved technical co-operation between these bodies and the British Cast Iron Research Association. The viewpoint was expressed that considerable variations in processing were encountered, some admittedly due to enamelling but many due to faulty castings—was it possible that some cast-iron surfaces were more suitable than others for enamel application, either from physical or compositional causes? It was decided that excursions into history for a solution were abortive; as processes and materials had so much changed over the years. A warning note was sounded, that, unless means of reducing the incidence of defective cast-iron enamelled components (and hence the cost) was found the domestic appliance market would be ripe for exploitation of competitive finishes, some of which were mentioned. One member advocated the organizing by a research association of a special investigation on this problem, sponsored by the Institute. At the conclusion, it was decided that the sub-committee should prosecute its work as a project of extreme urgency and the new figures and the paper given at that Conference should be used as a basis.

Other Sub-committee Work

Atlas of Defects.—This committee has finished cataloguing the defects it is desired to include but is still collecting specimens and photographs. Specimen pages for the Atlas were passed round for comment and more reports and examples of defects were solicited from members.

Organic Suspension Agents.—On this project, much work in progress was described, involving the collection of samples of commercially-available materials and data concerning them; again, continued assistance from members and users generally was requested.

Scumming of Enamels.—On the subject of enamel scumming it was reported that a summary of available literature had been compiled and was being sifted. Data on influence of atmosphere, mill additions, etc., was being assembled.

Enamel Standards.—Here, good progress was listed—the "acid-test" revision was in its final stages; a report on a diamond test apparatus was complete, as was a survey of the effect of cleaning materials; a bending test was being developed and a machine built; it had been decided that reproducible impact testing for universal application was not feasible. Mention was made of a "jolter" appliance to test the resistance to vibration and transport hazards of finished assembled cookers and the like. The need for immediate revision of the existing B.S. specifications for testing was emphasized.

Closing the proceedings, the chairman linked with his remarks a plea for continued co-operation and a request that additional subjects for work should be put forward for consideration by the Council. Finally a vote of thanks to the Chair commending the informal nature of the meetings and the procedure of having papers pre-printed and delivered only in *resumé* was proposed and carried with much applause.

Personal

MR. HENRY F. SPENCER, assistant managing director of Richard Thomas & Baldwins, Limited, has been appointed a managing director.

MR. N. A. STOKES has been appointed secretary of W. G. Bagnall, Limited, locomotive and railway wagon builders, etc., of Stafford.

MR. A. BRIZON has been nominated by the *Association Technique de Fonderie* as the vice-president of the International Committee of Foundry Technical Associations.

MR. W. H. LINDSEY, chief engineer of Armstrong Siddeley Motors, Coventry, has been appointed a director of the firm which he joined 19 years ago as a post-graduate apprentice.

MR. GAVIN C. PATERSON, of Paterson Hughes Engineering Company, Limited, last Tuesday left this country on a six-weeks' visit to his firm's agencies in India and Pakistan.

MR. M. E. FISHBURN has been appointed London manager of the Stanton Ironworks Company, Limited, in place of MR. R. KIMBER, who is retiring after 33 years' service with the company.

MR. J. REGAN, civil defence officer of Round Oak Steel Works, Limited, Brierley Hill (Staffs), recently staged an open evening, when various types of civil defence equipment were on show.

MR. SYDNEY F. SMITH, development engineer of the Birmingham works of the Dunlop Rubber Company, Limited, has been appointed the company's chief safety officer for Great Britain and civil defence adviser.

THE BOARD OF TRADE announce that the President has appointed MR. I. H. STUART BLACK, MR. W. G. N. WALKER and the BARON MARCHAND to be members of the Scottish Committee of the Council of Industrial Design.

MR. ALAN P. GOOD, managing director of the Brush Electrical Engineering Company, Limited, Loughborough, has resigned his position because of ill-health. He remains a director and deputy chairman of the Company.

SIR ARCHIBALD FORBES, president of the Federation of British Industries, has accepted an invitation to be the principal speaker at a luncheon in Toronto of the Canadian Chamber of Commerce, on the occasion of their 23rd annual meeting on October 23.

MR. K. S. JEWSON, M.I.Mech.E., director, Hobbies, Limited, of Dereham, is to lecture before the Norwich sub-section of the Institution of Production Engineers (of which he is Chairman) at the end of this month on the subject of "Production and Culture."

ALDERMAN W. DAVIS, an ironmoulder at a Kidderminster factory, at which he has worked for more than 48 years, was elected to the Town Council in 1945. He sits on ten committees, is chairman of one, and has attended 1,000 committee and public meetings since joining the council.

MR. A. CAMPBELL, chief mechanical engineer, and MR. W. FAIRLEY, deputy chief civil engineer to the Crown Agents for the Colonies, left last week for West Africa to discuss engineering and supply problems. They will spend about four weeks in Nigeria, three weeks in the Gold Coast, and a fortnight in Sierra Leone.

THE WOLVERHAMPTON METAL COMPANY, LIMITED, announce that from October 3 MR. ROBERT D. BURN, M.Sc., F.R.I.C., F.I.M., has joined the Board of their subsidiary, the James Bridge Copper Works, Limited, and has also accepted an alternate directorship on the Board of the parent company. Mr. Burn was previously on the Board of Hudson & Wright, Limited, brass and copper tube manufacturers, Birmingham.

MR. R. J. LAKELIN, production director of Sentinel (Shrewsbury), Limited, Diesel engine manufacturers, etc., received a number of presentations at the works upon his recent retirement. Among these was a gold watch from the directors, commemorating 30 years' service with the company. MR. CLEMENT JOHN CLOUD has also retired after 32 years with the same company. Mr. Cloud, who was assistant buyer, was presented with a cheque from the management and staff.

MR. DONALD R. O. THOMAS, chief education officer of the United Steel Companies, Rotherham, has been appointed a member of the Central Advisory Council for England, set up under the 1944 Education Act. Mr. Thomas visited the United States as a member of the team sponsored by the Anglo-American Council on Productivity to study the relations between industry and the universities in America. He is a member of the education committee of the Federation of British Industries, and of the training committee of the British Iron and Steel Federation.

Obituary

ONE OF THE longest-serving employees of the Cannon Iron Foundry, Deepfields, Bilston, MR. ARTHUR J. HARRIS, died recently. Mr. Harris, who was a bench moulder of the old school, had been with the firm for 57 years.

MR. DUNCAN MACARTHUR, director and general sales manager of Metropolitan-Vickers Electrical Company, Limited, died suddenly at his home in London on October 7, 1952. Mr. MacArthur had spent the whole of his business life with Metropolitan-Vickers, having joined the Company (then British Westinghouse) in September, 1906.

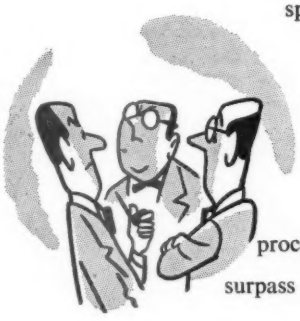
MR. WILFRID BAYLISS, well known in the chain and anchor trade, has died at Wolverhampton at the age 70. Portsmouth born, he went to Tipton in 1909 to become manager and later managing director of Joseph Wright & Company, Limited. He also became director of other chain manufacturing firms in the Old Hill and Cradley Heath area. During the first world war, Mr. Bayliss produced new types of mooring equipment for which he was commended by the Admiralty.

MR. HENRY CUNNINGHAM, chairman of Sir William Arrol & Company, Limited, bridgebuilders and engineers, etc., of Glasgow, since 1935, died recently at the age of 75. A former chairman of the British Constructional Steelworks Association, he was a director of the Lanarkshire Steel Company, Limited, Rivet, Bolt & Nut Company, Limited, and North-West Rivet, Bolt & Nut Factory, Limited.

SIR ARCHIBALD MCKINSTRY, vice-chairman of the Metal Box Company, Limited, London, W.1, has died at the age of 65. A former managing director and deputy chairman of Babcock & Wilcox, Limited, and chairman of the Metropolitan-Vickers Electrical Export Company, Limited, Sir Archibald was appointed a member of the Industrial Panel of the Ministry of Production in 1942. In the following year he became a representative of the Ministry of Supply on the Munitions Management and Labour Efficiency Committee of the Ministry of Production. He was a director of the British Broadcasting Company from 1922 to 1927.

Why all this argument about water?

To hear some manufacturers talk you would think no one would ever use anything but 'Dehybor' Anhydrous Borax. "It's cheaper", they say; "Saves storage space"; "Gives more frit for each smelt".



Others declaim that the little water in Neobor (pentahydrate Borax) makes it invaluable for *their* process, while some argue that nothing has, does, or ever will surpass ordinary hydrated Borax or Boric Acid.

But on one thing they all agree—whatever your manufacturing method, it pays you to specify '20-Mule Team'. May we send you full technical information and prices?

DEHYBOR (Anhydrous $Na_2B_4O_7$)

NEOBOR (Pentahydrate $Na_2B_4O_7 . 5H_2O$)

BORAX (Decahydrate $Na_2B_4O_7 . 10H_2O$)

BORIC ACID (H_3BO_3)

'20-MULE TEAM' PRODUCTS

BORAX CONSOLIDATED, LTD

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News in Brief

DESIGNED by Mr. H. S. Parsons, the British Compressed Air Society have issued a new sign for use by members at exhibitions and the like.

AN ORDER has been received by Ailsa Shipbuilding Company, Limited, Troon (Ayr), for a lightship tender from the Commissioners of Irish Lights.

OUTPUT OF TIN in Indonesia in August set up a new post-war record. According to the Tin Study Group, production totalled 3,419 tons, compared with 3,394 tons in July.

THE INSTITUTION OF MECHANICAL ENGINEERS are holding a meeting at the Dujon Restaurant, High Street, Bedford, at 7.30, October 22; to inaugurate a new branch in that town.

A REFRESHER COURSE for works and plant engineers is being held at the Engineering Centre, Glasgow, on Wednesday evenings, beginning October 15. The course is the first of its kind to be held in Scotland, and has been arranged by the Incorporated Plant Engineers.

THE DIRECTORS of Sturtevant Engineering Company, Limited, London, E.C.4, propose to capitalize £49,314 of general reserve in paying up 197,256 new 5s. shares and issuing them to shareholders registered on October 24 on the basis of one new share for every seven held.

DURING THE YEAR ended September 30, output of Bessemer steel ingots at the works of the Workington Iron & Steel Company branch of the United Steel Companies, Limited, reached an all-time record of 242,230 tons. Output of electric furnace ingots in the same period was 18,823 tons.

MR. H. WHITAKER, managing director of the Rustless Iron Company, Limited, Keighley, last week presented a wristlet watch and cheque to Mr. Herbert V. Foster, who is retiring at the end of the year after a record 50 years' employment with the firm, during which he has risen from office boy to chief despatch clerk.

AGREEMENT has been reached between management and operatives for a 29½-hr. week on tractor production at the Standard Motor Company's Banner Lane factory. This was one of three alternatives offered to employees, following a cut in tractor output from 314 a day to 207; the other alternatives involved dismissals ranging from 700 to 1,000.

NINETY PER CENT. of the space of the 1953 Paris International Trade Fair—the *Foire de Paris*—to be held in May, 1953, is already booked up. This Fair, founded in 1904, and little affected by two world wars, had 11,000 French and foreign firms exhibiting their wares this year. No fewer than 33 countries were represented, 13 of them with national stands.

ONE OF THE Royal Navy's largest aircraft carriers, H.M.S. Formidable, is to be scrapped, and will be broken up on either the Clyde or the Forth. The 23,000-ton carrier is at present lying at Portsmouth "in reserve." The Clyde built liner Ormonde (15,407 tons) now on her homeward journey from Australia, is to be broken up at Inverkeithing on the Forth.

AN AGREEMENT has been reached between R. A. Lister & Company, Limited, Dursley (Glos.), and the National Supply Company, Springfield, Ohio, for the sole distribution in the United States of the Lister range of Diesel engines. A close working association between the English and American companies in regard to research, production, and distribution, is provided for in the agreement.

MORE THAN 200 employees and their friends attended a dinner at the Princes Hall, Burslem, to celebrate the centenary of William Boulton, Limited, engineers, Burslem. Among those present were the Lord Mayor and Lady Mayoress of Stoke-on-Trent (Alderman and Mrs. G. L. Barber) and officials of the Company. Mr. E. M. Breeze has succeeded Mr. T. H. Gaskell as chairman of the Company.

R. J. RICHARDSON & SONS, LIMITED, Commercial Street, Birmingham, 1, have issued a "beer" mat, but its use is stated to be a laudable contribution to the elimination of ring stains made on desks by teacups. Obviously, they carry advertising matter, and on the reverse side a humorous cartoon. The utilitarian aspect is excellent and samples may be obtained by writing to the Richardson concern.

IT IS REPORTED THAT production at a Blackheath (Staffs) castings and gas-fittings firm has been brought to a halt by foreign competition. The secretary of the firm said that the management was "baffled." There had been a general slowing down of trade over the past two years, but now the export market had gone altogether. "We think it is mainly due to foreign competition, but the home trade is also very slack," he said.

AN OIL TANKER of 18,200 tons dw. is to be built by Sir James Laing & Sons, Limited, Sunderland, for Sir R. Ropner & Company (Management), Limited, as a substitute for one of the two 13¼-knot 11,000-ton tramps which the company was authorized to build under original arrangements. The propelling machinery for the new tanker will be supplied by R. & W. Hawthorn, Leslie & Company, Limited, Newcastle-upon-Tyne.

RELUCTANCE in British industry to take lessons from American counterparts is an unreasonable outlook. This was the conclusion expressed in Edinburgh on October 3 at a meeting held in the Heriot-Watt College by the British Association for Commercial and Industrial Education. The report prepared by the team sent to America last year by the Anglo-American Council on Productivity to study the training of industrial supervisors, or foremen, was discussed at the meeting.

AFTER CAREFUL CONSIDERATION the directors of Primrose & Company, Limited, Jane Street, Leith, have decided to cease manufacturing grey iron castings, and production will stop to-morrow. The company is entering into a contract to heat-treat, and fettle steel castings. It is anticipated that the company will employ approximately the same number of men on the new operation as were employed in the manufacture of iron castings, though the type of labour employed will be different.

THE FIRST of a series of talks by a lecturer of the West Yorkshire Region of the Economic League was given on October 6 to apprentices of George Crossley, Limited, engineers, of Albion Ironworks, Cleckheaton. This lecture dealt with the story of the earliest textile and iron workers and the rise of the merchant and craft guilds. Other lectures to follow will deal with the Industrial Revolution, the importance of steel, mass production, the cost of production, factory welfare, and new processes.

A CONTRACT worth almost £2,500,000 has been allocated to the Motherwell engineering firm of Hurst, Nelson & Company, Limited, by British Railways. This order, for 6,700 all-steel mineral wagons, is part of a total order for 22,200 placed with three British firms and is part of a five-year rebuilding programme. It follows the announcement by the Railway Executive that orders had been placed for 57,490 similar wagons, over 4,500 of which are to be constructed by P. & W. McLellan Limited, Glasgow.

ESCO INGOTS

REDUCE STORAGE SPACE

GUNMETAL and PHOSPHOR-BRONZE INGOTS

The smaller undivided Esco Ingot possesses many advantages over the old shape. Test Certificates are available for every batch.

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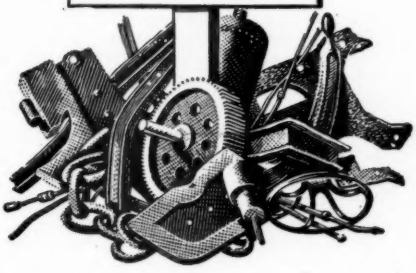
ALUMINIUM WORKS, WILLOW LANE, MITCHAM, SURREY

WHAT EVERY MANAGEMENT SHOULD KNOW ABOUT

scrap



What is scrap? Obsolete plant and machines, old spares, redundant buildings — anything made from iron and steel for which you have no foreseeable use.

What good is it to me? No good at all in its present state. But send it back to the steelworks and it can go to make the new steel that you and all steel-users need. Remember — a ton of scrap may make a ton of new steel.

Can't they make steel without scrap? Yes—but not enough steel. Last year, 58% of our steel was made from scrap. The more scrap we use the more coal, coke and iron ore we save for other important purposes.

What should I do with my scrap? See your local scrap merchant. He will be glad to help with dismantling and collection. If you have any trouble disposing of iron and steel scrap, write to the British Iron & Steel Federation for the address of your Joint District Scrap Committee.

What shall I get for it? You will be paid a fair price for your scrap. MORE IMPORTANT — you will be doing yourself and all steel-using firms a great service by helping to increase steel production.

SPEED THE SCRAP

SPEED THE STEEL

Issued for the STEEL SCRAP DRIVE, by the British Iron and Steel Federation and the National Federation of Scrap Iron, Steel and Metal Merchants

T.28

Raw Material Markets

Iron and Steel

A Ministry of Supply Order which came into force on Monday raises the maximum prices of basic-steel making iron and certain special foundry irons. Prices of common iron remain unchanged. The decision is intended to reduce losses on imported ore.

The increases are substantial. Basic pig-iron delivered station or siding has been raised from £12 10s. per ton to £13 19s. For hematite the increase is greater; for north-east coast delivery the price is now £16 2s., as against £13 11s. 6d., and there are corresponding increases for deliveries in other areas. Pig-iron with phosphorus from 0.1 per cent. up to 0.75 per cent. for Birmingham delivery is raised from £13 17s. 6d. to £16 8s. Scotch No. 3 foundry iron delivered Grangemouth is now £15 19s. 6d., as against £14 4s. 6d. Cylinder and refined irons are higher by 10s. per ton. Refined malleable iron with a maximum of 0.1 per cent. phosphorus is 20s. dearer. Ordinary foundry No. 3 iron, Staffordshire blast-furnace low-phosphorus foundry iron, and South Staffordshire blast-furnace low-phosphorus foundry iron, and South Staffordshire cold-blast iron are unchanged.

Since 1950 imported ore has been resold to consumers at prices which have not been raised despite the increases in world ore prices and in freight charges. Pig-iron makers are now to be charged prices more nearly approaching the true cost of purchase and transportation.

The increased price which steelmakers have to pay for pig-iron is offset by a decrease in the tonnage levy, so that no increase in the steel prices is necessary.

Copies of the Order, the Iron and Steel Prices (No. 3) Order, 1952 (No. 1795), are obtainable from the Stationery Office, price 2d. The new prices are incorporated in the list which appears on page 468.

As mentioned in previous reports, pressure from the foundries for pig-iron is now easier. While the recession in business is affecting all foundries, those producing castings for the textile trades and the light foundries engaged on castings for household equipment are the chief sufferers. The decline in export business and the restricted sales of goods on the home market have combined to reduce the demand for castings, with the result that some foundries now have capacity available. The engineering and speciality foundries, which for so long have been heavily engaged, are now experiencing quieter conditions, particularly those catering for the motor and allied trades, while many jobbing foundries are also feeling the effects of the trade recession.

Even now, however, the pig-iron requirements of the foundries are not all fully satisfied. In many cases allocations are lower than actual needs, while many foundries have no reserve stocks, a position they are anxious to remedy. Relining needs at some furnaces producing high-phosphorus pig-iron are reducing outputs by as much as 50 per cent., and as no stocks are available to cover this deficiency, the foundries will have to get along as best they can for a period of two or three months. The engineering and speciality foundries are using up all available supplies of low- and medium-phosphorus irons and hematite. Supplies of these grades are not now so difficult, due to reduced demand and improved outputs of hematite.

Foundry coke is coming forward in sufficient quantities to cover current needs, and some users have managed to build up stocks. Ganister, limestone, and firebricks are received to requirements.

The re-rollers continue to be fairly well employed on small sections, bars, and strip, chiefly for the home market. Apart from a reduction in their direct export trade, there is also a slowing down in business from home makers of machinery and equipment for overseas buyers. A revival of their export trade would be welcomed by the re-rollers now that supplies of steel are on a much better scale. But, with the wide difference between our export prices and those of foreign producers, there appears to be little prospect of any early improvement. Sheet re-rollers are busy on home and export orders for both black and galvanized sheets. Foreign makers are making strenuous endeavours to capture some of our export markets by price cutting, but so far our export trade for sheets remains good. The supply of semi-manufactured steel for the re-rollers continues satisfactory, with the major tonnage coming from oversea; it is expected that even better supplies will be forthcoming from abroad during the remainder of the year.

Non-ferrous Metals

As from Thursday of last week, the Ministry of Materials' price of zinc was reduced by £4 to £118 following a drop of 50 points in the United States to 13¼ cents. This was not unexpected, for a Custom smelter had been offering at 13½ cents for some time while the producers were holding for 14 cents. The outlook for zinc does not seem to be favourable and a further fall would not occasion any surprise. The lead price fell away rapidly last week, but a slight recovery was seen on Friday. On Tuesday and again yesterday (Wednesday), however, prices touched the lowest level since free dealings began. On the whole, trading has been decidedly active, comparing not unfavourably with pre-war conditions.

The following are the official prices for refined pig-lead:—

October—Thursday, £91 5s. to £91 15s.; Friday, £91 15s. to £92; Monday, £92 to £92 10s.; Tuesday, £87 10s. to £87 15s.; Wednesday £87 10s. to £87 15s.

January—Thursday, £91 5s. to £91 15s.; Friday, £91 15s. to £92; Monday, £92 to £92 5s.; Tuesday, £87 10s. to £87 15s.; Wednesday, £87 10s. to £87 15s.

The British Bureau of Non-ferrous Metal Statistics has published the details of consumption, etc., for the month of August; the details contain one or two items particularly noteworthy and interesting. For example, the U.K. consumption of tin, which has been averaging but little below 2,000 tons per month, dropped in August to 1,374 tons, which must surely be the lowest level touched for a very long time. Even the incidence of the holiday season would hardly seem to account for this drop.

Copper usage also declined—from 45,113 tons in July to 38,900 tons in August. Stocks of virgin copper went up by some 13,500 tons to 121,152 tons, the highest level seen for about 12 months. It certainly begins to look as though activity in the copper trade in this country is on the downgrade. Consumption of zinc in August, including secondary metal, was 16,511 tons, compared with 18,807 tons in July, and there was a rise in the stocks of virgin zinc from 106,112 tons at July 31 to 124,402 tons at the end of August. Lead stocks were virtually unchanged at 116,480 tons, while usage, virgin and secondary amounted to 18,452 tons, compared with 23,746 tons in July.

Official tin prices were:—

Cash—Thursday, £971 10s. to £972; Friday, £989 to £990; Monday, £990 to £992 10s.; Tuesday, £970 to £973; Wednesday, £970 to £974.

Three Months—Thursday, £957 5s. to £957 10s.; Friday, £968 to £969; Monday, £965 to £966: Tuesday, £956 to £957; Wednesday, £955 10s. to £956 10s.

ALUMINIUM SOLDERING PROBLEMS SOLVED BY ULTRASONICS

The Mullard Soldering Iron and Amplifier. The unit operates from a.c. mains and is robustly made to suit foundry conditions.

THE PROBLEM of soldering aluminium and other metals that form refractory oxides has at last been overcome by the use of ultrasonics in a practical, commercial form.

The new soldering equipment, developed in the Mullard Laboratories, removes oxide film by ultrasonic cavitation and provides a "clean" metallic surface.

Ultrasonic soldering has special applications in light metal foundries. Here are some of the ways in which it can help you:

- *Blow holes and cavities in aluminium castings quickly and efficiently filled.*
- *Porosity effectively sealed in low-stress aluminium castings.*
- *Alterations to existing aluminium patterns easily and economically made.*

WRITE AT ONCE FOR LEAFLET No. M13574 WHICH GIVES FULL DETAILS.

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UNDER
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Only a balanced combination of skill and science can produce Ingots which are consistent with the specification
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WORKS
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ST. STEPHEN'S STREET ASTON BIRMINGHAM 6 TEL. ASTON CROSS 3111
CHRONICLE BUILDINGS CORPORATION STREET MANCHESTER 4 TEL. BLACKFRIARS 5741
PEMBROKE BUILDINGS PIER STREET SWANSEA TEL. SWANSEA 4035

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered, unless otherwise stated)

October 15, 1952

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £13 1s. 6d.; Birmingham, £12 15s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £16 8s., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £15 5s. 9d.

Scotch Iron.—No. 3 foundry, £15 19s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £17 14s. 6d.; South Zone, £17 17s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £18 14s. 6d.; South Zone, £18 17s.

Cold Blast.—South Staffs, £18 2s.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £16 2s; Scotland (Scotch iron), £16 8s. 6d.; Sheffield, £17 3s.; Birmingham, £17 9s. 6d.; Wales (Welsh iron), £16 8s. 6d.

Basic Pig-iron.—£13 19s. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered.)

Ferro-silicon (6-ton lots).—40/55 per cent., £57 10s., basis 45% Si, scale 21s. 6d. per unit; 70/84 per cent., £86, basis 75% Si, scale 23s. per unit.

Ferro-vanadium.—50/60 per cent., 22s. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £204; ditto, copper-free, £212.

Ferro-tungsten.—80/85 per cent., 28s. 7d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 31s. 7d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £85 4s., basis 60% Cr, scale 28s. 3d. per unit; 6/8 per cent. C, £80 17s., basis 60% Cr, scale 26s. 9d. per unit; max. 2 per cent. C, 2s. per lb. Cr; max. 1 per cent. C, 2s. 2½d. per lb. Cr; max. 0.15 per cent. C, 2s. 3½d. per lb. Cr; max. 0.10 per cent. C, 2s. 3¾d. per lb. Cr; max. 0.06 per cent. C, 2s. 4d. per lb. Cr.

Cobalt.—98/99 per cent., 20s. per lb.

Metallic Chromium.—98/99 per cent., 6s. 5d. to 6s. 9d. per lb.

Ferro-manganese (blast-furnace). — 78 per cent., £49 0s. 8d.

Metallic Manganese.—93/95 per cent., carbon-free, £262 per ton.

SEMI-FINISHED STEEL

Re-ro'ling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 4s. 6d.; tested, 0.08 to 0.25 per cent. C (100-ton lots), £25 14s. 6d.; hard (0.42 to 0.60 per cent. C), £27 12s.; silico-manganese, £33 8s.; free-cutting, £28 8s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £31 9s.; case-hardening, £31 17s.; silico-manganese, £34 9s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 8s.; basic, hard, over 0.41 up to 0.60 per cent. C, £30 8s.; acid, up to 0.25 per cent. C, £31 17s.

Sheet and Tinplate Bars.—£25 3s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £29 14s.; boiler plates (N.-E. Coast), £31 1s. 6d.; chequer plates (N.-E. Coast), £31 3s.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £27 17s.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 15s. 6d.; flats, 5 in. wide and under, £31 15s. 6d.; hoop and strip, £32 10s. 6d.; black sheets, 17/20 g., £41 12s. 6d.; galvanized corrugated sheets, 24 g., £53 3s.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £50 18s. 3d.; nickel-chrome, £71 7s. 9d.; nickel-chrome-molybdenum, £79 2s. 6d.

Tinplates.—57s. 1½d. per basis box.

NON-FERROUS METALS

Copper.—Electrolytic, £285; high-grade fire-refined, £284 10s.; fire-refined of not less than 99.7 per cent., £284; ditto, 99.2 per cent., £283 10s.; black hot-rolled wire rods, £294 12s. 6d.

Tin.—Cash, £970 to £974; three months, £955 10s. to £956 10s.; settlement, £972.

Zinc.—G.O.B. (foreign) (duty paid), £118; ditto (domestic), £118; "Prime Western," £118; electrolytic, £122; not less than 99.99 per cent., £124.

Lead.—Refined pig-lead: October, £87 10s., to £87 15s.; January, £87 10s. to £87 15s.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £138 15s.; rolled zinc (boiler plates), all English destinations, £136 15s.; zinc oxide (Red Seal), d/d buyers' premises, £142.

Other Metals.—Aluminium, ingots, £157; magnesium, ingots, 2s. 10½d. per lb.; antimony, English, 99 per cent., £225; quicksilver, ex warehouse, £64 10s. to £64 15s.; nickel, £454.

Brass.—Solid-drawn tubes, 27½d. per lb.; rods, drawn, 37½d.; sheets to 10 w.g., 31½d.; wire, 33d.; rolled metal, 30d.

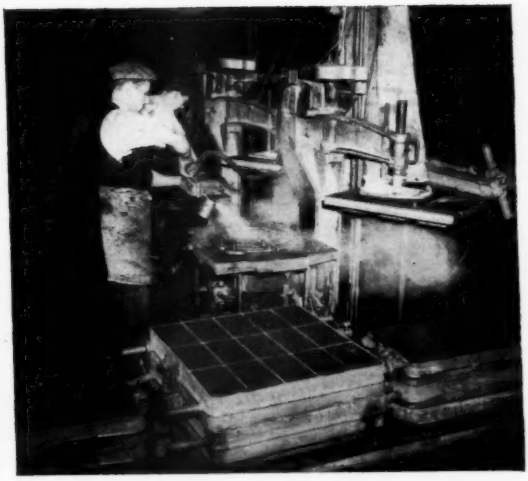
Copper Tubes, etc.—Solid-drawn tubes, 32⅜d. per lb.; wire, 317s. 9d. per cwt. basis; 20 s.w.g., 346s. 3d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £198 to £218; BS. 1400—LG3a—1 (86/7/5/2), £218 to £238; BS. 1400—G1—1 (88/10/2), £345 to £375; Admiralty GM (88/10/2), virgin quality, £352 to £380 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £355 to £385; L.P.Bl, £250 to £275 per ton.

Phosphor Bronze.—Strip, 44d. per lb.; sheets to 10 w.g., 46½d.; wire, 49½d.; rods, 44½d.; tubes, 42½d.; chill cast bars: solids 4s. 4d., cored 4s. 5d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 2s. 9½d. per lb. (7%) to 3s. 10½d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 3s. 3½d. (7%) to 4s. 4½d. (30%); to 12 in. wide × .056, 3s. 3½d. to 4s. 4½d.; to 25 in. wide × .056, 3s. 5½d to 4s. 6½d. Spoon and fork metal, unsheared, 3s. 0½d. to 4s. 1½d. Wire, 10g., in coils, 3s. 9½d. (10%) to 4s. 10½d. (30%). Special quality turning rod, 10%, 3s. 8½d.; 15%, 4s. 1½d.; 18%, 4s. 6½d. All prices are net.



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New Patents

The following list of patent specifications accepted has been taken from the "Official Journal (Patents)." The numbers given are those under which the Specifications will be printed and all subsequent proceedings will be taken. Applications for copies of the full Specifications (2s. 8d. each, post free) should be made to the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

678,530 LEONE, O. J., and LEONE, D. P. Blast furnaces.

678,637 CLEVELAND MAGNESITE & REFRACTORY COMPANY, LIMITED. Reinforced bricks for basic furnace lining.

678,798 FARBENFABRIKEN BAYER. Materials for foundry cores and moulds.

678,828 HERBERT, LIMITED, A. Supplying molten alloy to die-casting machines of the cold chamber type.

679,009 METALLGES. AKT.-GES. Circular sintering apparatus.

679,017 BRETTELL. LIMITED, T. & J., and NASH, D. Moving floors or tables for conveying bars, angles, etc., from a rolling mill.

679,075 COMPAGNIE GENERALE DES CONDUITES D'EAU SOC. ANON. Centrifugal casting.

679,165 AMERICAN CYANAMID COMPANY. Treatment of iron-ore flotation concentrates.

679,172 STANDARD TELEPHONES & CABLES, LIMITED, and MAYER, S. E. Production of metal or metal oxide powders and products therefrom.

679,273 CANADIAN REFRACTORIES, LIMITED. Magnesia-alumina-silica refractories.

679,419 BATTELLE DEVELOPMENT CORPORATION. Titanium coating.

679,420 HANNEN, C. Vibrating arrangement for the separation of admixtures from molten metal baths.

679,434 MALLORY-SHARON TITANIUM CORPORATION. Titanium alloys.

679,435 ELECTRIC FURNACE PRODUCTS COMPANY, LIMITED. Alloy addition agent and method of using it.

679,439 BADISCHE ANILIN- & SODA-FABRIK. Production of metal powders and mass cores therefrom.

679,452 SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST.-GOBAIN, CHAUNY, ET CIREY. Production of high quality silico-aluminous refractories.

679,639 GREAT LAKES STEEL CORPORATION. Fuzing and agglomerating fine particles of material.

679,705 MALLORY-SHARON TITANIUM CORPORATION. Titanium alloys.

679,913 BIRLEC, LIMITED, and SCHULTE, F. W. K. Heat-treatment of thin metal goods.

680,123 BADER. O. C. A., GODOT, D. R., and MONIN, P. M. A. Cast iron containing graphite in nodular form and process of making it.

680,281 BRITISH THOMSON-HOUSTON COMPANY. Improving the corrosion resistance of ferrous articles.

680,322 INLAND STEEL COMPANY. Pickling iron and steel.

680,379 SAUTER, H., and HAHN, W. [trading as HAHN & KOLB]. Die-casting, injection moulding, and like machines.

680,536 SCHOONENWOLF, H. G., and CAPELLE, A. Apparatus for discharging material such as coal, cereal, or the like, heaped up in a container, such as a wagon.

680,567 WAKEFIELD & COMPANY, LIMITED, C. C. Prevention of corrosion of metals by gases and vapours.

680,699 FORD MOTOR COMPANY, LIMITED. Metal casting processes.

680,770 LEEDS & NORTHRUP COMPANY. Temperature measurement of molten materials.

Increases of Capital

SANBRA, LIMITED, Birmingham, increased by £50,000, in 1s. ordinary shares, beyond the registered capital of £200,000.

WALSALL CONDUITS, LIMITED, increased by £150,000, in 4s. ordinary shares, beyond the registered capital of £350,000.

RYALAND (MANCHESTER), LIMITED, engineers, increased by £4,900, in £1 shares, beyond the registered capital of £100.

BIRMID INDUSTRIES, LIMITED, Smethwick (Staffs), increased by £1,500,000, in £1 shares, beyond the registered capital of £1,500,000.

SPEIRS, LIMITED, structural engineers, etc., of Glasgow, increased by £32,000, in £1 ordinary shares, beyond the registered capital of £30,000.

M. PAPIER, LIMITED, general engineers, of London, E.C.2, increased by £18,000, in £1 ordinary shares, beyond the registered capital of £2,000.

HAWTHORN BAKER, LIMITED, engineers, of Dunstable (Beds), increased by £10,000, in £1 ordinary shares, beyond the registered capital of £4,500.

BRITANNIA IRON & STEEL WORKS, LIMITED, Bedford, increased by £150,000, in £1 ordinary shares, beyond the registered capital of £300,000.

JOHN O. HOLT & SON, LIMITED, metal merchants, of Birmingham, increased by £5,000, in £1 ordinary shares, beyond the registered capital of £10,000.

JOHN W. HARKER & COMPANY, LIMITED, engineers, of London, E.C.3, increased by £5,000, in £1 ordinary shares, beyond the registered capital of £10,000.

DAVIES MAGNET WORKS, LIMITED, machinery manufacturers, of Ware (Herts), increased by £4,900, in £1 ordinary shares, beyond the registered capital of £100.

MONTGOMERIE REID ENGINEERING COMPANY, LIMITED, Bramley (Hants), increased by £5,000, in £1 ordinary shares, beyond the registered capital of £5,000.

ROCKWELD, LIMITED, electrical welding apparatus manufacturers, of Croydon (Surrey), increased by £28,000, in £1 ordinary shares, beyond the registered capital of £35,000.

A. E. FARR, LIMITED, engineers, etc., of London, E.C.2, increased by £200,000, in 55,000 7 per cent. preference and 145,000 ordinary shares of £1, beyond the registered capital of £50,000.

LANCASTER & COMPANY (BOW), LIMITED, iron-founders, mechanical engineers, etc., of London, E.3, increased by £25,000 in £1 ordinary shares, beyond the registered capital of £25,000.

RECORD ELECTRICAL COMPANY, LIMITED, electrical machinery and appliance manufacturers, of Altrincham (Ches), increased by £49,800, in £1 ordinary shares, beyond the registered capital of £30,200.

J. T. ROTHWELL & COMPANY, LIMITED, boiler makers, etc., of Church (Lancs), increased by £80,000, in £1 ordinary shares, beyond the registered capital of £20,000. At June 30, 1952, the General Electric Company, Limited, held 17,161 shares out of 20,000 issued.

FERGUSON, WILD & COMPANY, LIMITED, iron-ore merchants, of London, E.C.3, increased by £75,000, in £1 ordinary shares, beyond the registered capital of £75,000. At August 8, 1951, Northern Mercantile & Investment Corporation, Limited, and William Baird & Company, Limited, each held 27,500 shares out of 55,000 shares issued. These companies were each allotted a further 22,500 shares on July 30, 1952.

SHOTTON BROS., LIMITED, metal manufacturers, of Oldbury (Worcs), increased by £35,000, in £1 ordinary shares, beyond the registered capital of £66,000. On June 12, 1952, Darnall Industries, Limited, held 21,082 ordinary and 16,177 preference shares out of 21,132 ordinary and 21,181 preference and 15,853 redeemable preference shares issued. This company was allotted a further 38,868 ordinary shares on August 13, 1952.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference E.P.D. or C.R.E. can be obtained from the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

SOUTH AFRICA. November 6—Aluminium bronze bar, for the South African Railways. Room 6148 (CRE/32648/52).

SOUTH AFRICA. November 6—Phosphor bronze bar, strip, and sheet, for the South African Railways. Room 6148 (CRE/32167/52).

FORMOSA. October 20—Turbine, pump, and accessories, for the Central Trust of China, financed by the Mutual Security Agency. Room 7154 (CRE/32409/52).

FORMOSA. October 29—Textile machinery and accessories, for the Central Trust of China, as agent for the Council for United States Aid. Room 7166 (CRE/33163/52).